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The Scleractinia (Cnidaria: Anthozoa) of Abu-Musa and Sirri Islands, Persian Gulf

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Parisa Alidoost Salimi, Pargol Ghavam Mostafavi, Chaolun Allen Chen, Seyed Mohammad Reza Fatemi, and Michel Pichon (2018) There are many islands in the Iranian waters, but little is known about their coral species. This is a first attempt to describe and illustrate the coral species occurring in Abu-Musa and Sirri Islands. Overall, 26 species belonging to 9 families are reported, and three unidentified species and two species are added to coral communities of Iran. This study also provides overall insight on coral fauna in the Persian Gulf.

Key words: Corals, Morphological identification, Abu-Musa Island, Sirri Island, Persian Gulf.

BACKGROUND

The Persian Gulf, which is considered part of the Indo-Pacific, is a semi-enclosed epicontinental sea that is linked to the Oman Sea by the Strait of Hormuz (Sheppard et al. 1992). The coral fauna of the Persian Gulf appear to be relatively similar to those of the Red Sea and the Gulf of Aden. The similarity could be due to a shared paleoceanographic history of restriction during the last sea-level low stand and simultaneous flooding during the Holocene transgression (Riegl and Purkis 2012). Despite this shared restriction, the Red Sea has more endemic species and greater diversity than the Persian Gulf (Sheppard and Sheppard 1991; Riegl and Purkis 2012; Rasul and Stewart 2015). Nevertheless, the low coral diversity in the Persian Gulf may not necessarily be the result of primary isolation, because a same or even a greater isolation has occurred in the Red Sea (Coles 2003).

Compared to other coral communities in tropical regions, the coral fauna of the Persian Gulf have been subjected to a wide range of natural stressors (Riegl and Purkis 2012; Coles 2003; Burt et al. 2014). The extreme seasonal variation in sea surface temperature (16-36°C), high turbidity, high salinity (36-43 PPT), and overall stressful conditions have led to regular coral mortality, which has eventually prevented the build-up of a true reef framework. Therefore, the coral assemblages in this region are more appropriately referred to as “coral carpets” rather than “coral reefs” (Burt et al. 2014). In fact, coral carpets are defined as non-accreting coral communities and non-three dimensional structures; the colonies grow on exposed rocky substrates rather than building on older dead coral skeletons. This type of coral

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assemblages is generally dominated by sediment-tolerant species and mainly occupies flat areas (Riegl and Piller 1999; Burt et al. 2014).

Most studies on corals species, such as those carried out by Downing (1985), Sheppard and Wells (1988), Sheppard and Sheppard (1991), Carpenter et al. (1997) and Riegl and Purkis (2012) are related to the southern parts of the Persian Gulf. These studies revealed that the highest coral diversity is found in Saudi Arabia (50 species) and then the UAE (34 species) (Sheppard and Sheppard 1991; Coles 2003; Riegl and Purkis 2012). Compared to the southern regions, fewer studies have been conducted on coral species in Iranian waters. There are 17 islands in Iranian waters that are surrounded by corals including Farsi, Greater and Lesser Tombs, Abu-Musa, Sirri, etc. However, lack of information and research on the coral fauna from the Iranian Islands in comparison to the southern parts has led to underestimation of the actual richness of coral species in this region. So far, 31 species from Nay-Band Bay and Kish and Farur Islands and 40 species from Larak Island have been reported (Fatemi and Shokri 2001; Riegl and Purkis 2012; Vajed Samiei et al. 2013, Rahmani et al. 2013; pers obs).

The presence of numerous coral species in the Persian Gulf demonstrates the adaptability of many Indo-Pacific species to the environmental conditions experienced in the Gulf and their tolerance to extreme conditions. Such tolerance could also help better understand the potential survival and adaptation of similar coral species elsewhere, in the face of climate change (Coles and Riegl 2013; Burt et al. 2014).

The aim of this study was to describe and illustrate the coral species occurring in Abu-Musa and Sirri Islands. Abu-Musa and Sirri Islands are located about midway across the width of the Persian Gulf (near the Strait of Hormuz) and their coral communities are mostly found in the shallow waters. Nomenclature for genera and families is based on the recent changes introduced by Budd et al. (2012) and later taxonomic revisions. This study also provides overall insight into the coral fauna composition from the Persian Gulf by amalgamating observations from the present study with previous reports.

MATERIALS AND METHODS

Before actually sampling the coral species in Abu-Musa and Sirri Islands, initial surveys were conducted using manta tow method to find out representative areas in terms of coral coverage. Based on coral coverage, six sites in Abu-Musa and four sites in Sirri Islands respectively were selected for coral sampling (Fig. 1). Sampling

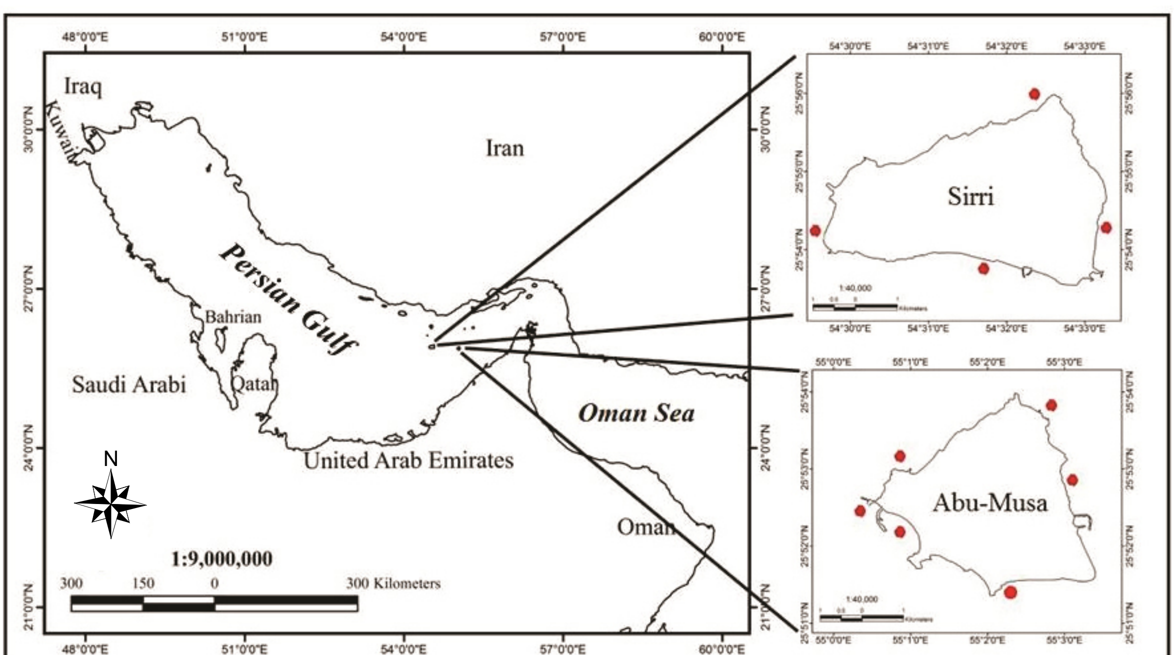

Fig. 1. Abu-Musa and Sirri Islands in the Persian Gulf; the red circle indicates the sampling sites.

was carried out along non-straight lines (due to scattered coral distributions) by scuba diving in August 2015 at depths between 3-10 m, except for *Turbinaria* sp. 1, *Turbinaria peltata* and *Goniopora djiboutiensis*, which were collected by one deep diving at a depth of 22 m in Sirri Island. The corals were photographed *in situ* using an underwater camera, Canon G12. Approximately 5-10 cm^2 of each colony was broken off using hammer and chisel and transported to Marine Biology laboratory of Science and Research Branch, Azad University. In the laboratory, coral samples were bleached in a sodium hypochlorite solution (10%), rinsed with fresh water, and then air-dried. All available specimens were examined under a stereomicroscope (Leica, EZ490). Specimens were identified to the species level based on skeleton traits (as corallite arrangement, septa, columella, costae, paliform lobes, etc.) according to available taxonomic guides (Veron et al. 1977; Veron and Pichon 1979 1982; Veron and Wallace 1984; Miller 1994; Pichon et al. 2010; Riegl and Purkis 2012). The skeletal characters were measured and counted from 5-20 randomly selected mature corallites per colony. Twenty-six samples from Hengam, Larak and Kish Islands and Nay-Band Bay were also collected in December 2016 and May 2017, and were included in this study as additional materials. All the collected specimens are lodged in the Zoological Museum of University of Tehran (ZUTC), Accession No. from ZUTC 6578 to 6634.

RESULTS

Overall, we collected sixty-one specimens of scleractinian corals from Abu-Musa and Sirri Islands. Twenty-six species belonging to 9 scleractinian families have been identified and they are described and illustrated below.

Family Acroporidae Verrill, 1902
Genus *Acropora* Oken, 1815

Acropora downingi Wallace, 1999
(Fig. 2)

Synonym: *Acropora downingi* Wallace, 1999

Material examined: Abu-Musa Island (ZUTC 6578), Sirri Island (ZUTC 6579).

Other Material: Larak Island (ZUTC 6580), Hengam Island (ZUTC 6581).

Description: Color was brown to dark brown. Colonies are Plate-like with short vertical branches over the plates. Corallite diameter 1 mm. Primary septa well developed. Coenosteum between redial corallite simple spinule and costate. Radial wall porous.

Distribution: Widespread in the Persian Gulf and Red Sea. However, most of *Acropora* species have bleached in summer 2017 as a result of extreme summer temperatures. In some area as Bahrain, Abu Dhabi (Riegl and Purkis 2012) and in the Nay-Band bay in Busher Province (Personal observation), presence of *Acropora* species is reduced or disappeared.

Genus *Montipora* de Blainville, 1830

Montipora sp.
(Fig. 3)

Synonym: *Montipora* de Blainville 1830; *Manopora* Dana, 1846.

Material examined: Abu-Musa Island (ZUTC 6582).

Description: Color is uniformly pale light brown. Colony is encrusting to sub massive. Corallites diameter is almost 1 mm. Six septa in 2 alternating orders, secondary septa limited to wall. Corallites immersed. Theca papillae (5-6) taller than coenosteum papillae and not fused together. Coenosteum reticulated. Columella absent.

Remarks: The colony was small size. Corallites were relatively similar to those of *Montipora aequituberculata* (Veron and Wallace 1984). The specimen of *Montipora* cf. *aequituberculata* deposited at ZTUC (Acc. No Cnid. 1003) have been re-examined, but its growth forms and the corallites does not resemble to the present specimen.

Distribution: Known from the northern part of the Persian Gulf.

Family Agariciidae Gray, 1847
Genus *Pavona* Lamarck, 1801

Pavona decussata (Dana, 1846)
(Fig. 4)

Synonym: *Pavonia decussata* Dana, 1846; *Pavona lata* Dana, 1846; *Pavona seriata* Brüggemann, 1879.

Material examined: Abu-Musa Island (ZUTC 6583), Sirri Island (ZUTC 6584).

Other Material: Nay-band Bay (ZUTC 6585), Kish Island (ZUTC 6586).

Description: Color is greenish with some shade of brown. Colony is encrusting at the base from which numerous thick bifacial fronds extending more or less vertically, upper margin of fronds straight or contorted. Corallites arrangement is thamnasterioid and formation by extratentacular budding. Septa arranged in 2 alternating orders, primary septa markedly exert, thick and reaching/fusing to the columella. Secondary septa less

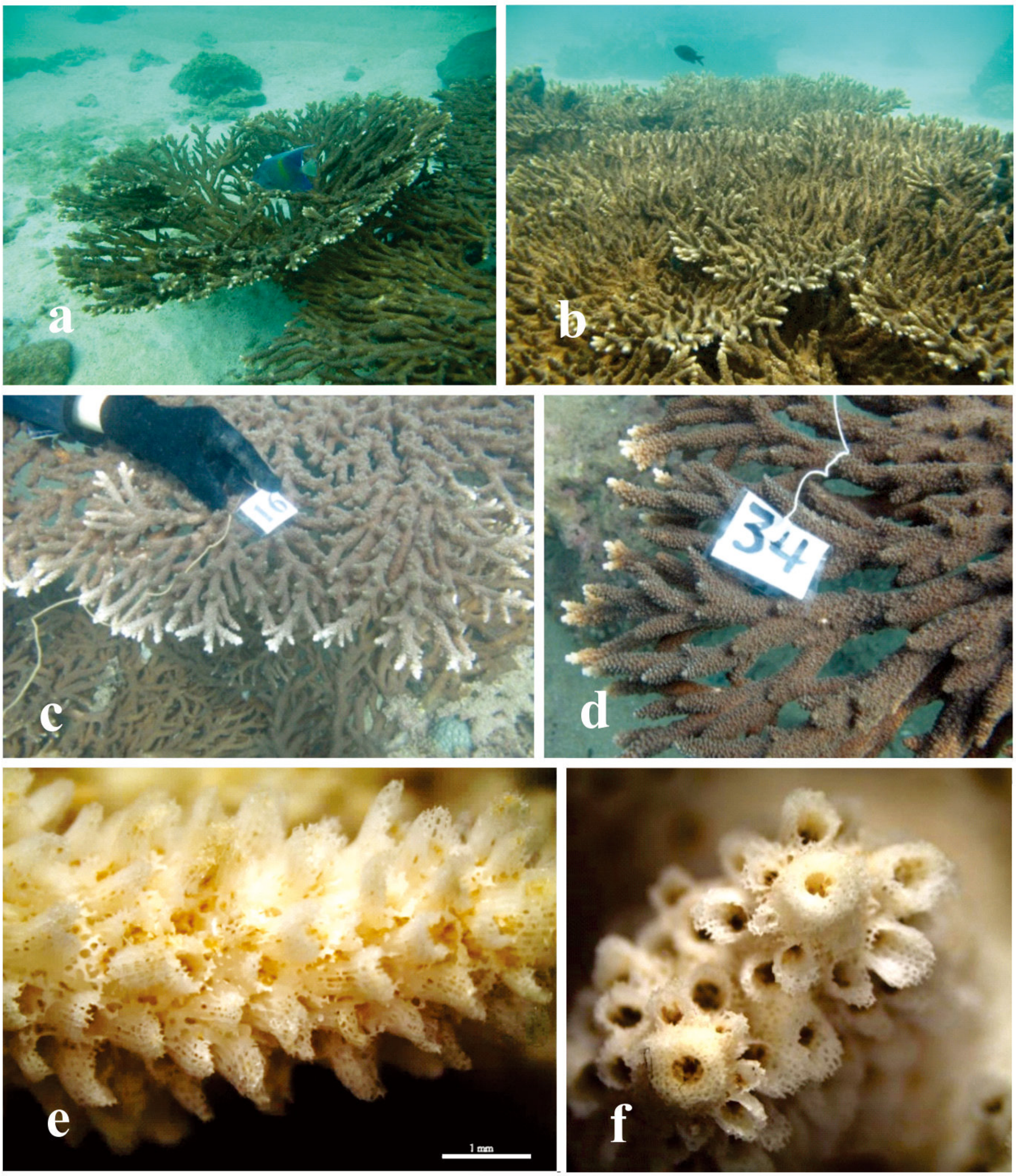

Fig. 2. *Acropora downingi*, (a-b) Abu-Musa and Sirri Islands; (c-d) Larak and Hengam Islands; (e-f) close-up of radial and axial corallites. Scale bar = 1 mm.

exert, short and sometimes only discerned at the calice rim. Septal margin is smooth, plunging vertically into the calices. Septocostae is well developed, regular, in straight rows alternating in thickness and height. Columella is a single low boss or granule, rod-like, sometimes flattened laterally. Coenosteum reticulated.

Remarks: In the Persian Gulf, *P. decussata* displays two colony forms; type 1 (Fig. 4a) have a thick bifacial fronds extending more or less vertically with greenish color. In type 2 (Fig. 4b), the bifacial frond is not clear and color is white-brown. Phylogenetic analysis (rDNA region) carried out by authors showed that both mentioned types are monophyletic and well supported (unpublished study).

Distribution: Widespread in the Persian Gulf, Red Sea and the Indo-Pacific.

Pavona cactus (Forskål, 1775)
(Fig. 5)

Synonym: *Madrepora cactus* Forskål, 1775; *Pavona praetorta* Dana, 1846; *Pavona formosa* Dana, 1846; *Pavona venusta* Dana, 1846; *Lophoseris knorri* Milne Edwards & Haime, 1851.

Material examined: Sirri Island (ZUTC 6587).

Description: The color is pale light brown. Margins paler in color than the sides. Colony is typically frondose, fronds thin, bifacial and anastomosing. Free upper margin, either straight or contorted. Corallites arrangement is

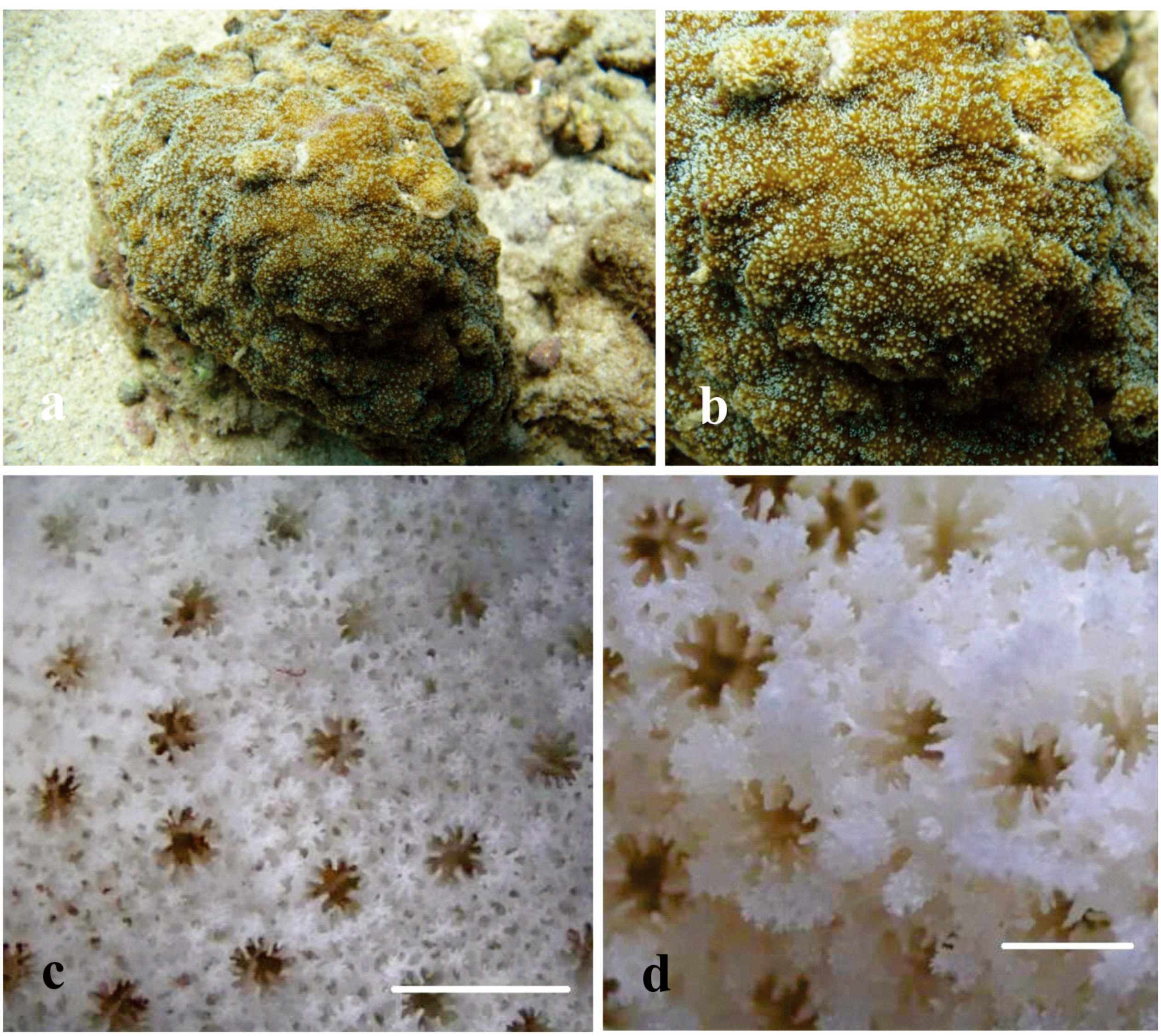

Fig. 3. (a-b) *Montipora* sp. from Abu-Musa Island; (c-d) close-up of corallites. Scale bar = 1 mm.

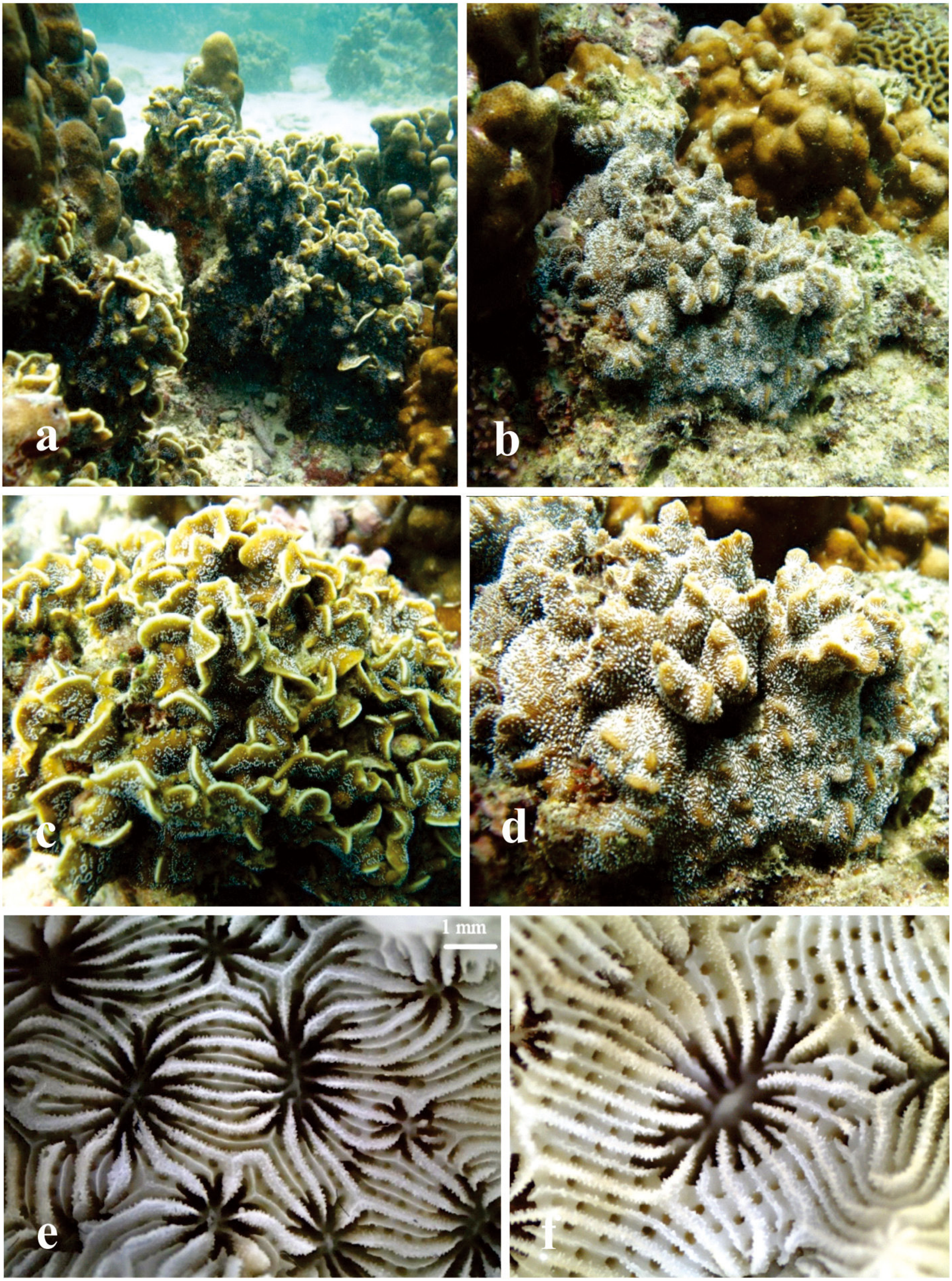

Fig. 4. (a-b) Different colonies of *Pavona decussata* from Abu-Musa and Sirri Islands; (c-d) close-up of orallites. Scale bar = 1 mm.

thamnasterioid and formation by extratentacular budding. Septa are in 2 alternating orders, Primary septa slightly exert and reaching/fusing to the columella. Secondary septa less exert and short. Septocostae is well developed, regular straight rows between corallite centers. Columella is rod-like (styliform). Coenosteum reticulated.

Remarks: This species has much thinner fronds than *P. dacussata*. There is a similarity between *P. cactus* and *P. frondifera*, but striking difference in their colony shapes. Plates usually have radiating ridges which intergrade with fronds in *P. frondifera*.

Distribution: Common in the Persian Gulf, Red Sea, Indo-Pacific.

Family Dendrophylliidae Gray, 1847
Genus *Turbinaria* Oken, 1815

Turbinaria peltata (Esper, 1794)
(Fig. 6)

Synonym: *Madrepora peltata* Esper, 1794; *Gemmipora peltata* Esper, 1794, *Turbinaria dichotoma* Verrill, 1870; *Turbinaria maxima* Ortmann, 1888.

Material examined: Sirri Island (ZUTC 6588).
Other Material: Kish (ZUTC 6589).

Description: Colony is a horizontal plate, thickness range 7-13 mm. Corallites are conspicuously larger than in any other *Turbinaria* species. Corallites arrangement is plocoid, from slightly protruding to immersed, also present on the edge of the corallum. Corallites average diameter 4 mm. Septa arranged mostly in 2 orders with 20-23 septa, at time hardly distinguishable. They project inwards 1/2 calice radius. Columella is one or a few elongate lamellar process with granulated

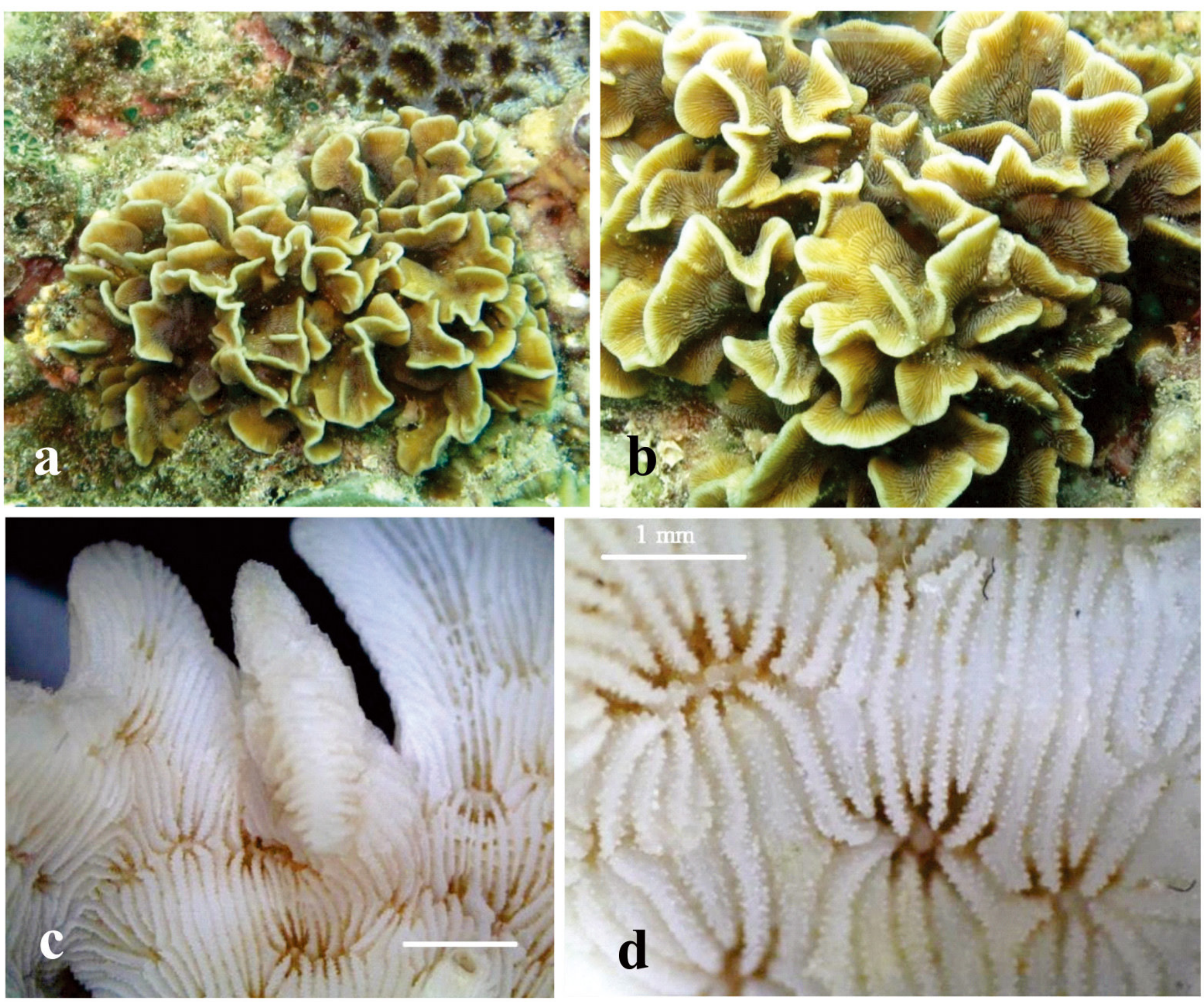

Fig. 5. (a-b) *Pavona cactus* from Sirri Islands; (c-d) close-up of corallites. Scale bar = 1 mm.

sides. Costae absent. Coenosteum and exotheca are reticulated and echinulated.

Remarks: It is mostly found in the deeper parts of the reefs. Affinities of *T. peltata* to the genus *Duncanopsammia*, Wells, 1936 have been suggested by Arrigoni et al. 2014.

Distribution: Not common in the Persian Gulf and usually can be found in deeper waters.

***Turbinaria* sp. 1**
(Fig. 7)

Synonym: *Explanaria* Lamarck, 1816; *Gemmipora* de Blainville, 1830; *Turbinacis* Quenstedt, 1880.

Material examined: Sirri Island (ZUTC 6590).

Description: Colony is a small plate, attached to the bottom. The plate thickness is 2-7 mm. Corallites are small but distinctly protuberant, roughly arranged in lines more or less parallel to the margin of the corallum. A line or series of corallites conspicuously present on the very edge of the corallum. Calice diameter range 1-3 mm. Septa are well developed, reaching up to 2/3 of the calice radius with mostly 12 septa in one order. Septal margins distinctly and irregularly serrated. Columella is a small peg-like trabecular rising vertically. Occasionally the calice is almost completely invaded by a large mass of twisted and anastomosed trabecular, giving the appearance of a "closed" corallite. Costae absent. Coenosteum and exotheca are reticulated and echinulated.

Remarks: Corallites are similar to those of *T. reniformis*. However, the growth form differs from *T. reniformis* that had been reported from Abu-Dhabi (Riegl and Purkis 2012). The corallites size is smaller than that of the same species in the Yemen (Pichon et al. 2010). Because of limited material and small colony, positive species identification is not possible.

Distribution: Rare in the Persian Gulf.

***Turbinaria* sp. 2**
(Fig. 8)

Synonym: *Explanaria* Lamarck, 1816; *Gemmipora* de Blainville, 1830; *Turbinacis* Quenstedt, 1880.

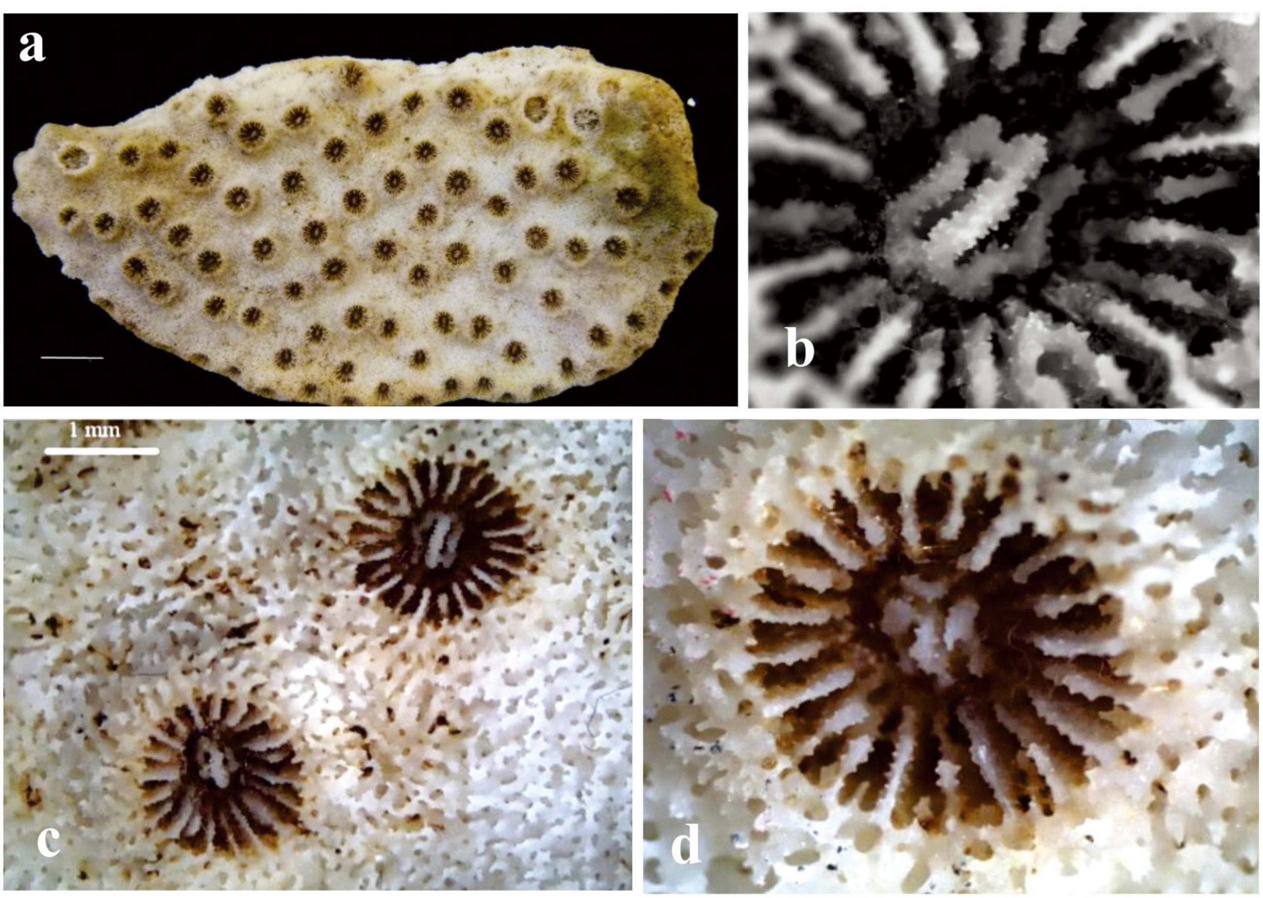

Fig. 6. (a) *Turbinaria peltata* from Sirri Island. Scale bar = 1 cm; (b-d) close-up of corallites and columella. Scale bar = 1 mm.

Material examined: Sirri Island (ZUTC 6591).

Description: The color is light brown. Colony is small, encrusting and irregular in shape. Corallites formation by extratentacular budding. Corallites are tubular and mostly protruding above the surface of the corallum, nearly cylindrical to semi-conical in shape with aperture circular. Calice diameter 1-2 mm. Septa are mostly 12 to 16 in one order, very short and most projecting inwards 1/3 calice radius. Septal free inner margin usually vertical or near vertical, very finely dentate, side smooth without ornamentation. Columella is smooth and twisted. Coenosteum and exotheca are reticulated and echinulated.

Remarks: This specimen was found in shallow waters of Sirri Island. Because of limited material, positive species identification is not possible.

Distribution: Rare in the Persian Gulf.

Family Plesiastreidae Dai & Horng, 2009
Genus *Plesiastrea* Milne Edwards and Haime, 1848

***Plesiastrea versipora* (Lamarck, 1816)**
(Fig. 9)

Synonym: *Astraea versipora* Lamarck, 1816; *Plesiastrea urvillei* Milne Edwards & Haime, 1849; *Plesiastrea quatrefagiana* Milne Edwards & Haime, 1849; Milne Edwards & Haime (as *P. quatrefaeesana*) (1857); Brüggemann (1879); *Plesiastrea peroni* Milne Edwards & Haime, 1857; *Favia versipora* Lamarck 1816; *Plesiastrea proximans* Dennant, 1904; *Orbicella gravien* Vaughan, 1918; *Favia ingolfi* Crossland, 1931.

Material examined: Sirri Island (ZUTC 6592).

Description: Color is light brown. Colony is encrusting and irregular in shape. Corallites formation by extratentacular budding. Corallites are close to each other, arrangement is plocoid and

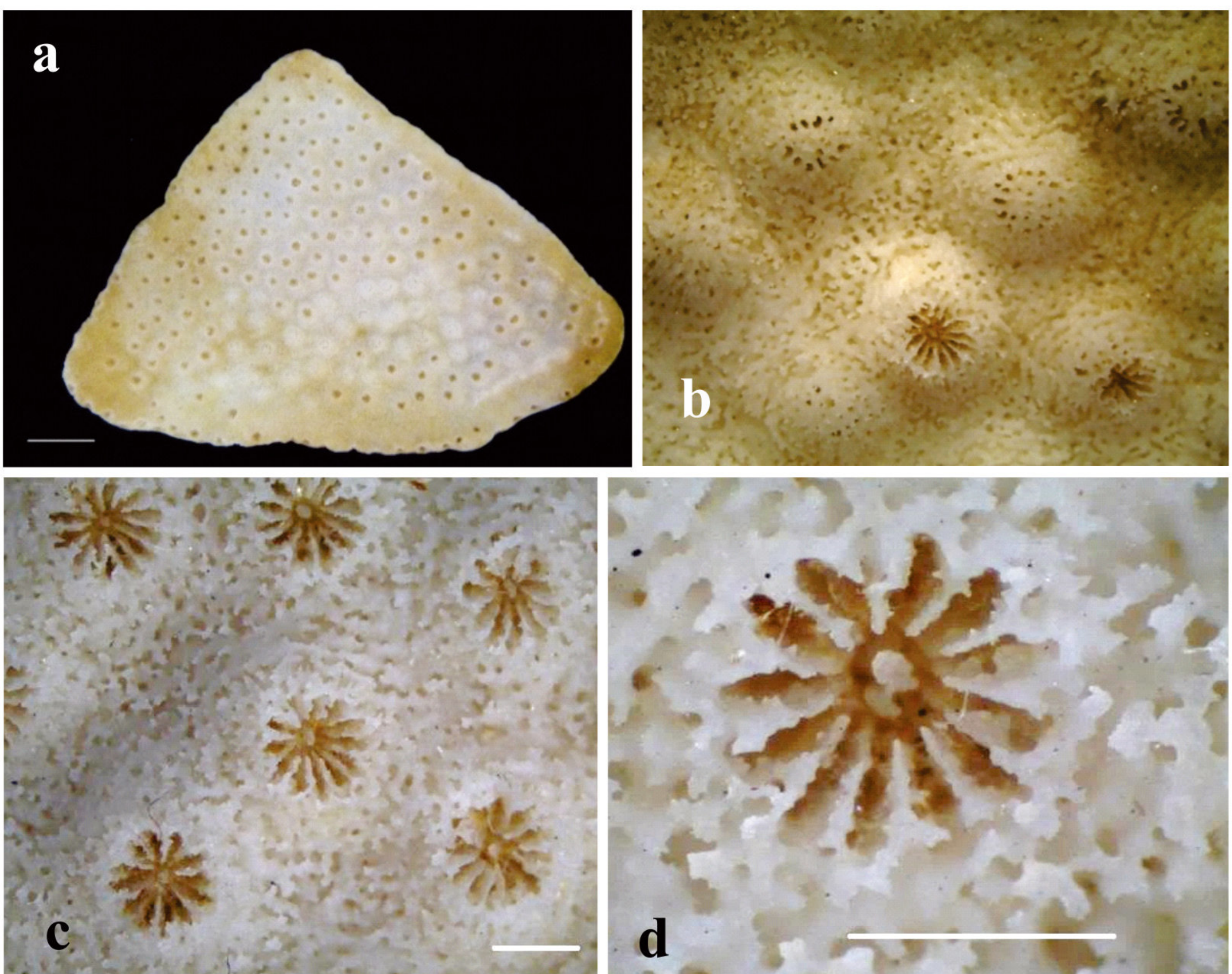

Fig. 7. (a) *Turbinaria* sp.1 from Sirri Islands. Scale bar = 1 cm; (b-d) close-up of corallites. Scale bar = 1 mm.

outline circular to subcircular (diameter 3-4 mm). Septa are in two orders; first order reach columella, secondary order is shorter (S1 and S2:12-13) but rarely in some large corallites S1 and S2:19-25. Primary septa markedly exert with margins dentations. Septal side granulated. Pali structures well developed. Wall is distinct and comparatively thin. Coenosteum is smooth and occasionally with a few granulated ridges. Columella is small and papillose (trabecular).

Remarks: This specimen showed some morphological affinities with *Astrea devantieri* Veron, 2000. However, *P. versipora* and *A. devantieri* are genetically distinct (Benzoni et al. 2011).

Distribution: Not common in the Persian Gulf. Widespread in the Red Sea and Indo-Pacific.

Incertae sedis Genus *Leptastrea* Milne Edwards and Haime, 1848
Leptastrea pruinosa Crossland, 1952
(Fig. 10)

Synonym: *Leptastrea pruinosa* Crossland, 1952.

Material examined: Abu-Musa Island (ZUTC 6593), Sirri Island (ZUTC 6594).

Other Material: Nay-Band Bay (ZUTC 6595).

Description: Colony is encrusting with irregular shapes. Corallites are polygonal to subcircular; formation by extratentacular budding.

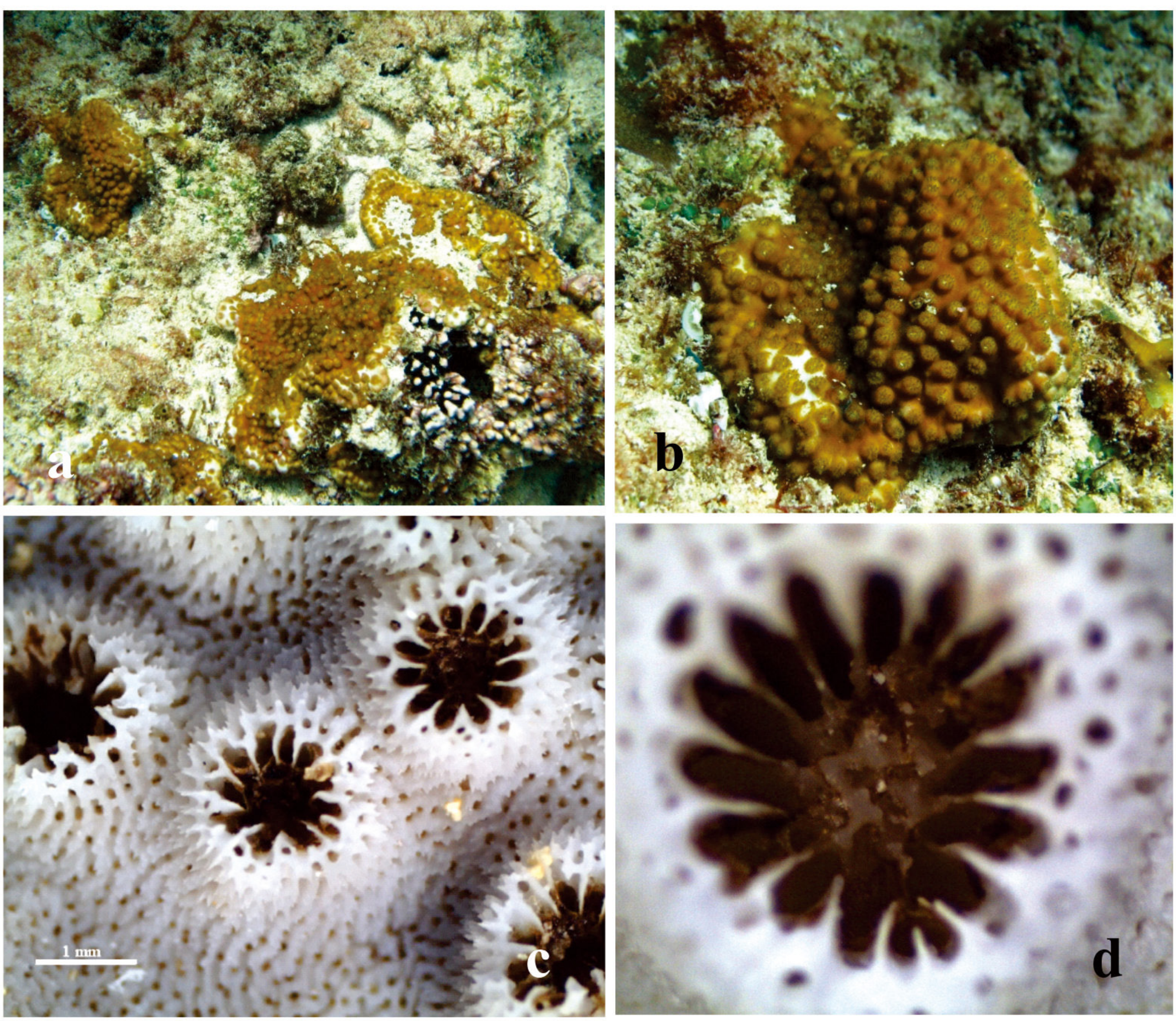

Fig. 8. (a-b) *Turbinaria* sp.2 from Sirri Island; (c-d) close-up of corallites and columella. Scale bar = 1 mm

Arrangement mostly is plocoid. Corallite diameter is 3-7 mm. 24-47 septa in 2 or 3 orders, most are slightly exert above the wall margins; septal margins ornamented with dentations increasing in size toward the calice center. Septal free inner margins regularly oblique and usually sloping gently towards the columella. Small septa sometimes fusing to the sides of larger septa.

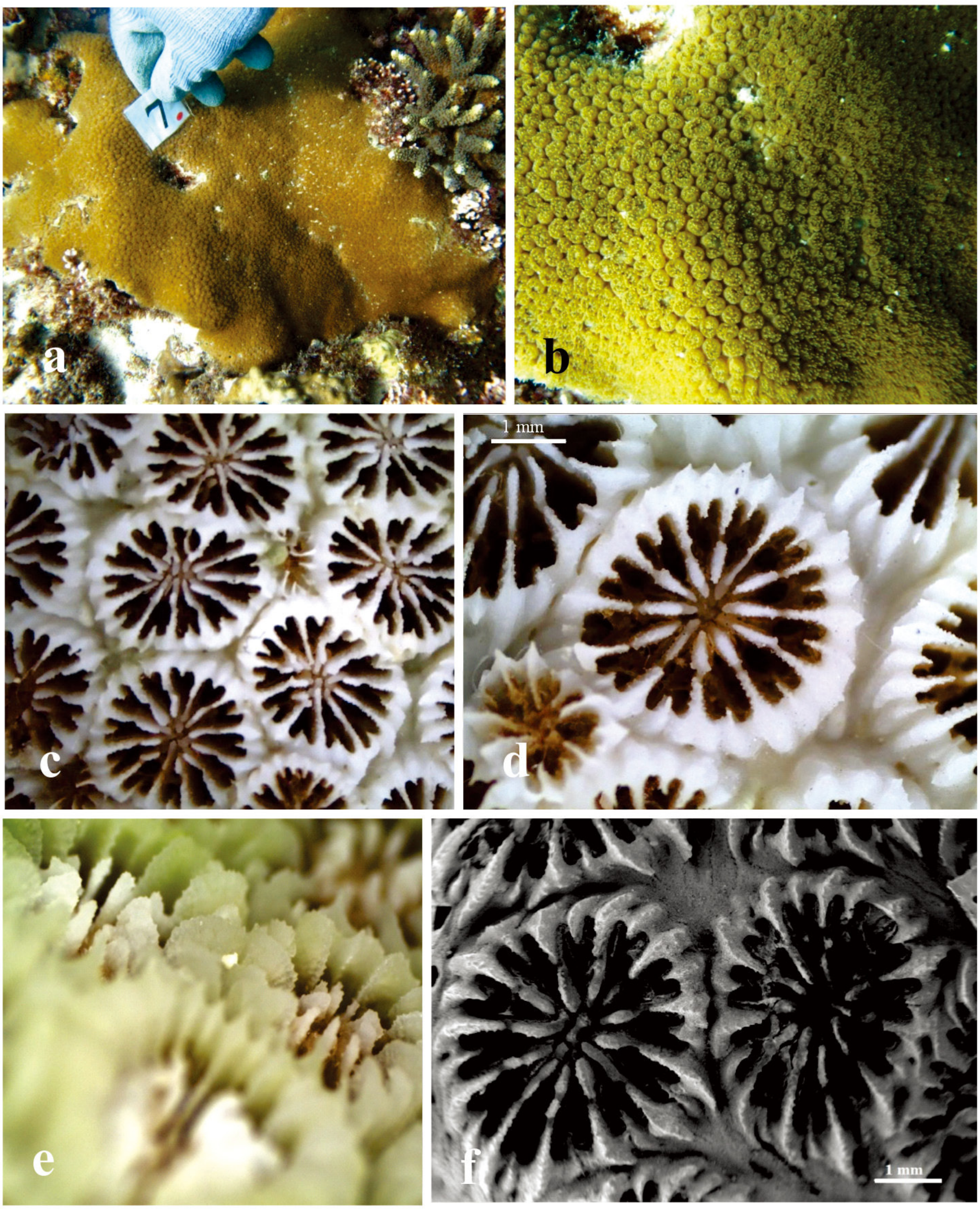

Fig. 9. (a-b) *Plesiastrea versipora* from Sirri Islands; (c-d) close-up of corallites and extratentacular budding; (e) exsert septa and well developed pali; (f) SEM image of corallites. Scale bar = 1 mm.

Columella trabecular and intermixed with lower septa dentation. Costae absent. Coenosteum is smooth and usually forms a narrow strip between adjacent corallites.

Remarks: Presence of green color on center of polyps is a criterion for field identification.

Distribution: Common in northern part of the Persian Gulf.

Leptastrea transversa **Klunzinger, 1879**
(Fig. 11)

Synonym: *Leptastrea transversa* Klunzinger, 1879.

Material examined: Abu-Musa Island (ZUTC 6596).

Description: Colony is small and encrusting. Corallites formation by extratentacular budding and arrangement is plocoid. Corallites diameter 3 mm. Septa are in 2 orders with 24-29 septa (in a few corallites up to 42) and slightly exert above the wall. Primary septa is reaching the columella, secondary septa is short and limited to wall. Septal margins are horizontal at first near the wall, then descending vertically and rapidly towards the calice center. Margins slightly dentate, with a paliform lobe weakly developed in some corallites. Columella trabecular and trabecular often fused. Costae absent. Coenosteum is smooth and distance between adjacent corallites variable.

Distribution: Common in the Persian Gulf, Red Sea and Indo-Pacific.

Family Merulinidae Verrill, 1865
Genus *Cyphastrea* Milne Edwards and Haime, 1848

Cyphastrea serailia **(Forskål, 1775)**
(Fig. 12)

Synonym: *Madrepora serailia* Forskål, 1775; *Cyphastrea danai* Milne Edwards & Haime, 1857; *Cyphastrea brueggemanni*

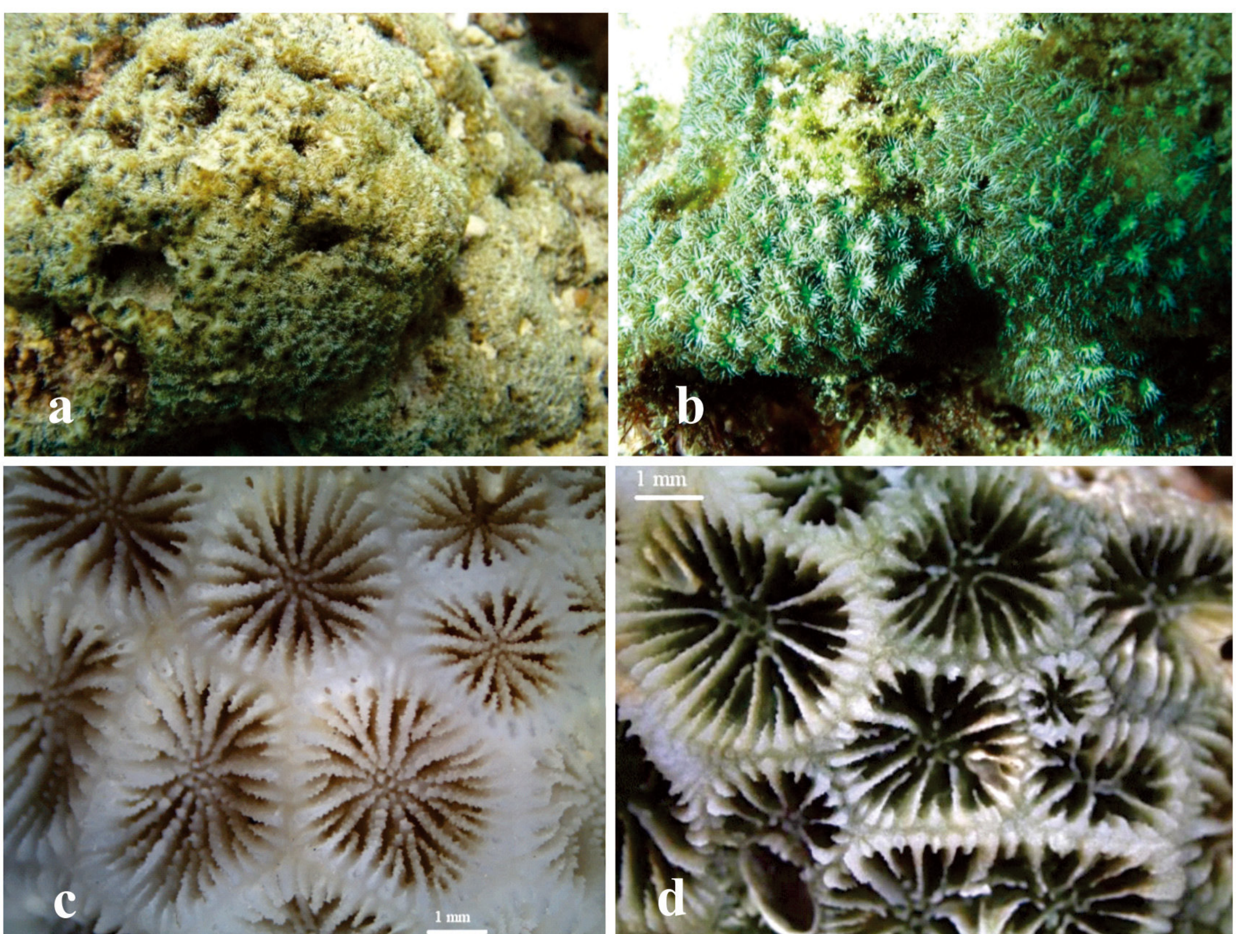

Fig. 10. (a-b) Colonies of *Leptastrea pruinosa* from Abu-Musa and Sirri Islands; (c-d) close-up of corallites and septal arrangement. Scale bar = 1 mm.

Quelch, 1886; *Cyphastrea suvadivae* Gardiner, 1904; *Cyphastrea conferta* Nemenzo, 1959; *Cyphastrea laticostata* Nemenzo, 1959; *Cyphastrea incrustans* Klunzinger, 1879; *Cyphastrea maldivensis* Gardiner, 1904.

Material examined: Abu-Musa Island (ZUTC 6597).

Other Material: Nay-Band Bay (ZUTC 6598).

Description: Colony is submassive with numerous irregular short columnar processes extending mostly vertically. Corallites formation by extratentacular budding and arrangement is plocoid. Corallite aperture is slightly protruding, flush with corallum surface or immersed, outline circular. Corallites diameter 2 to 3 mm. Septa in 2 markedly distinct orders, with 12 primary and 12 secondary septa (in a majority of calices), Primary septa are exert above the wall margin and reach the columella. Secondary septa reduced (and limited to a ridge on the inside of the wall). Septal margins serrated. Costae are equal or un-equal and poorly developed. Coenosteum not heavily ornamented but a few granules present. Columella is loosely trabecular.

Distribution: Widespread in the Persian Gulf, Red Sea and western Indo-Pacific.

***Cyphastrea microphthalma* (Lamark, 1816)**
(Fig. 13)

Synonym: *Astraea microphthalma* Lamarck, 1816; *Cyphastrea aspera* Quelch, 1886; *Cyphastrea gardineri* Matthai, 1914; *Cyphastrea muelleri* Milne Edwards & Haime, 1851; *Cyphastrea savignyi* Milne Edwards & Haime, 1849.

Material examined: Abu-Musa Island (ZUTC 6599), Sirri Island (ZUTC 6600).

Other Material: Kish Island (ZUTC 6601).

Description: Colony is irregular and sub massive to encrusting. Corallites arrangement is plocoid and formation by extratentacular budding. They are circular in outline, average diameter 2

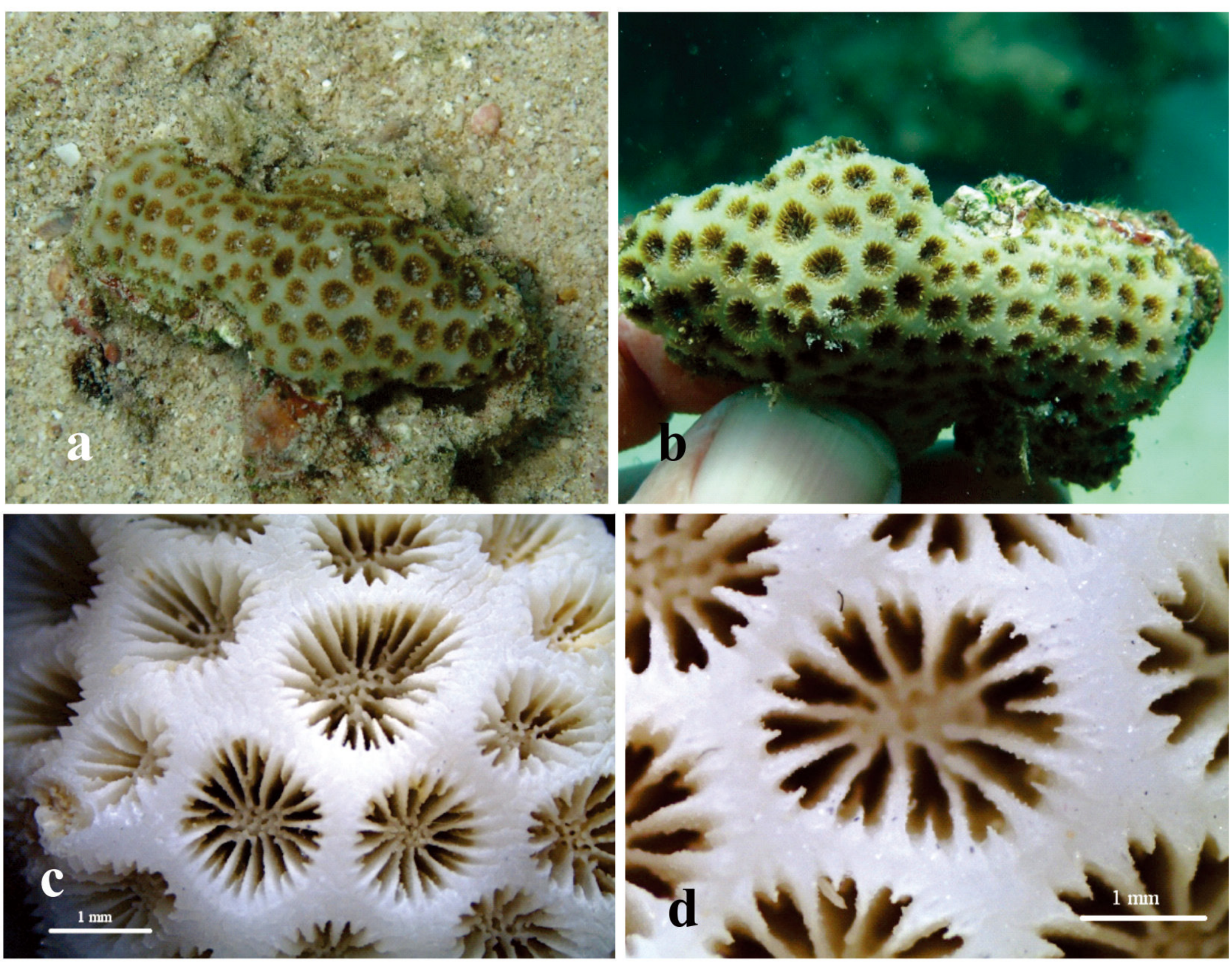

Fig. 11. (a-b) *Leptastrea tranversa* from Abu-Musa Island; (c-d) close-up of corallites. Scale bar = 1 mm.

to 3 mm. Septa are in 2 orders with 10 primary and 10 secondary septa (in most calices); primary septa markedly exert, reaching the columella, secondary septa are less exert and short (< R/3 on average). Secondary septa limited to the wall. Septal margins finely serrated. At the base of the septal margin, occasionally one long, thin, twisted paliform structure extends vertically or obliquely upwards at times merging with the columella. Costae present, first order well developed bearing 2 or 3 blunt spines, second order is little developed or obsolete. Coenosteum is covered with granules or blunt spines, themselves bearing minute star-shaped ornamentations. Columella is trabecular (compact).

Distribution: Widespread in the Persian Gulf, Red Sea and Indo-Pacific.

Genus *Favites* Link, 1807

Favites pentagona (Esper, 1794)
(Fig. 14)

Synonym: *Madrepora pentagona* Esper, 1794; *Astraea deformis* Lamarck, 1816; *Aphrastraea deformis* Milne Edwards & Haime, 1848; *Prionastraea gibbosissima* Milne Edwards & Haime, 1850; *Goniastrea rudis* Milne Edwards & Haime, 1850; *Plesiastrea haeckeli* Brüggemann, 1878; *Favia adduensis* Gardiner, 1904; *Stephanocoenia maldivensis* Gardiner, 1904; *Favites parvicella* Nemenzo, 1959; *Favites gailei* Chevalier, 1971.

Material examined: Abu-Musa Island (ZUTC 6602), Sirri Island (ZUTC 6603).

Other Material: Kish Island (ZUTC 6604).

Description: Colony is encrusting to nodular with irregular shapes. Corallites arrangement is

Fig. 12. (a-b) *Cyphastrea serailia* from Abu-Musa Island; (c-d) close-up of corallites, coenosteum and septal arrangement. Scale bar = 1 mm.

cerioid and formation by intratentacular budding. Corallite outline is irregular and subcircular to polygonal, at times distinctly pentagonal. Calice diameter 3-6 mm. Septa are mostly in two orders, primary septa reaching the columella with conspicuous paliforme lobes. Secondary septa reduced and limited to the wall, in some corallites a third order of septa can be observed but is much reduced and limited to wall (or abortive). Septal margins have small-tiny horizontal flattened teeth. Well-developed paliform lobes forming a crown around the columella. Columella is compact or made of few tangled trabecular poorly developed. Theca is thick and angular.

Remarks: This species displays different colony forms. Main differences among specimens were the shapes of paliform lobes and their ornamentation (Fig. 15a). Indeed, skeletal examination indicated corallites traits (*e.g.* paliform crown, septa, etc.) were stable among the specimens (Fig. 15c-d).

Distribution: Widespread in the Persian Gulf, Red Sea and Indo-Pacific.

Favites chinensis **(Verrill, 1866)**
(Fig. 15)

Synonym: *Prionastraea chinenis* Verrill, 1866; *Favites yamanarii* Yabe & Sugiyama, 1935.

Material examined: Abu-Musa Island (ZUTC 6605).

Description: Colony is encrusting and irregular, with a few humps a few cm high above the general surface of the corallum. Corallites arrangement is cerioid and formation

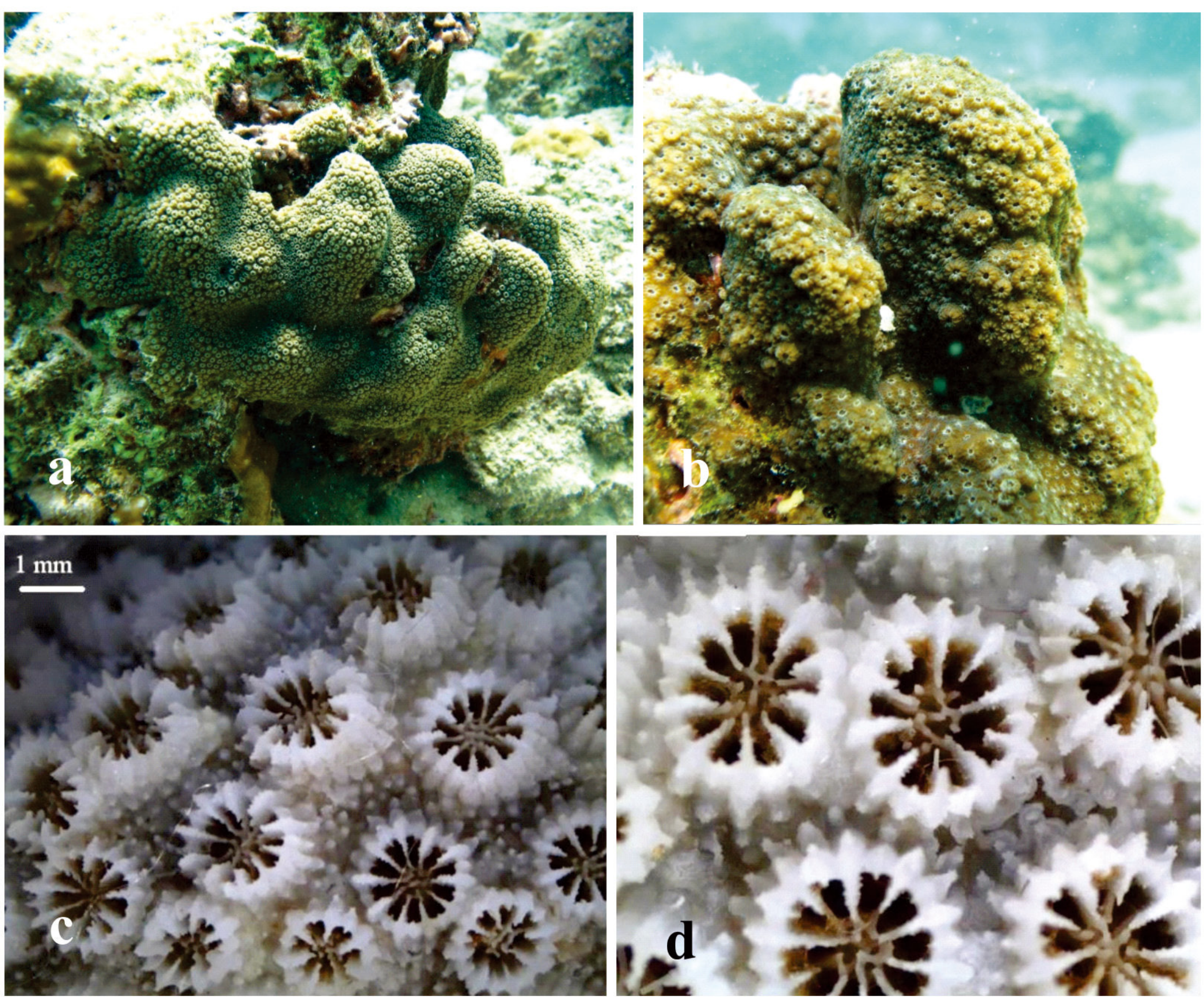

Fig. 13. (a-b) *Cyphastrea microphthalma* from Sirri and Abu-Musa Islands; (c-d) close-up of corallites, coenosteum and septal arrangement. Scale bar = 1 mm.

by intratentacular budding. Outline subcircular to polygonal. Calice diameter is 5-8 mm. Some corallites are raised and have a nodular form. Up to 40 septa regularly spaced in two orders. First order reaching the columella. Second order reduced and limited to wall. Septal margin dentation well developed, size of the dentations increasing near the calice center. Septa of adjacent corallites are continuous above the common walls. Paliform lobes are absent or inconspicuous. Columella is spongy. Theca is angular, particularly in the corallites present on the nodules or humps of the corallum. The structure and appearance of the thecae often vary greatly from one part of the corallum to another. They are usually thin and irregular on hillocky parts and broad on flat parts where calices are shallow.

Remarks: In the present study, the specimens have slightly larger corallites than those found outside the Persian Gulf. This species may be confused with *F. abdita* or *F. pentagona* in the field. However, the wall of *F. chinensis* is thinner than *F. pentagona* and the corallite is fairly angled (Sheppard and Sheppard 1991).

Distribution: Rare in the Persian Gulf and Indo-Pacific.

Genus *Platygyra* Ehrenberg, 1834

Platygyra daedalea (Ellis and Solander, 1786) (Fig. 16)

Synonym: *Madrepora daedalea* Ellis & Solander, 1786; *Astroria astraeiformis* Milne Edwards & Haime, 1849; *Astroria*

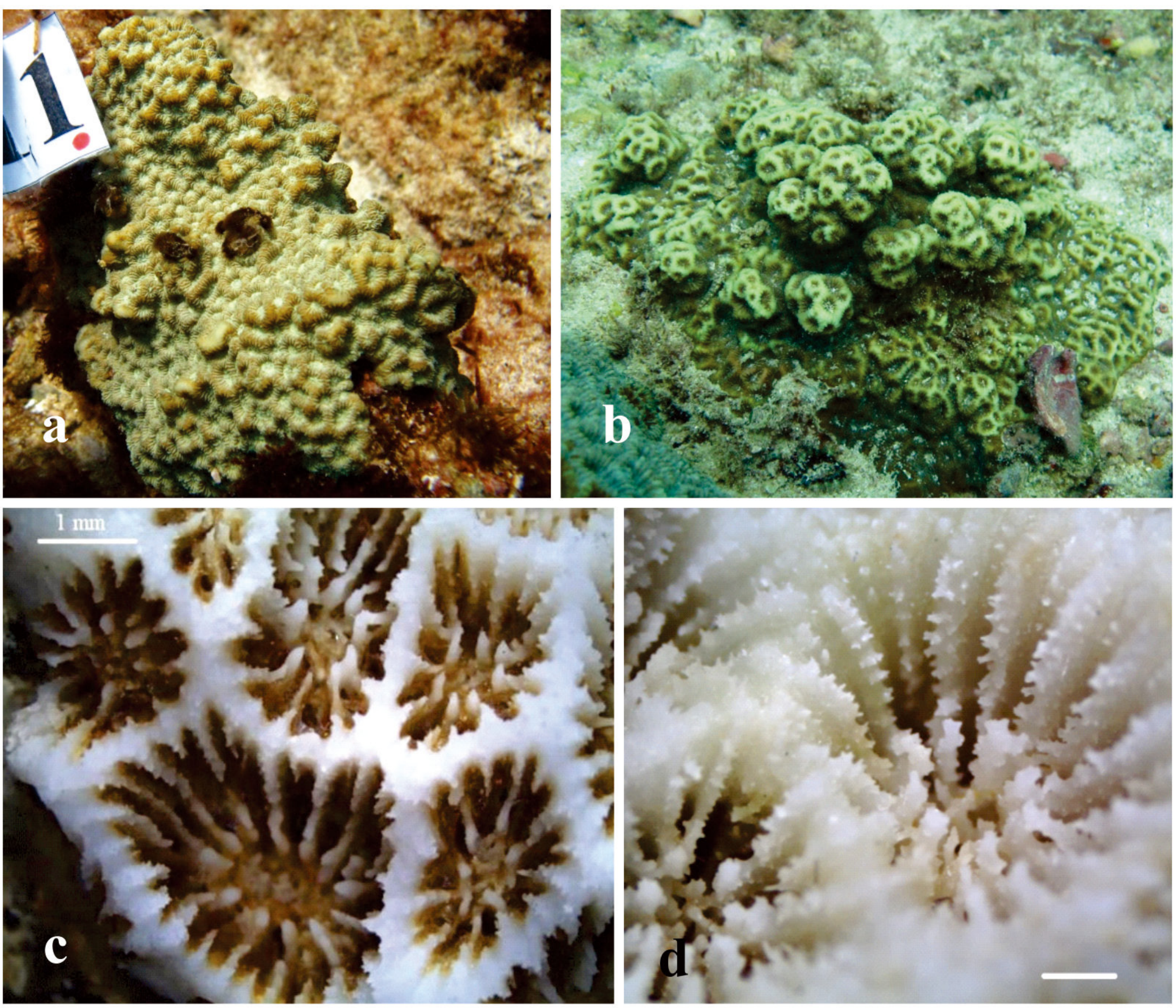

Fig. 14. (a-b) Morphotypes of *Favites pentagona* from Sirri and Abu-Musa Islands; (c-d) close-up of corallites and well developed paliform. Scale bar = 1 mm

daedalea (Ellis & Solander, 1786); *Astroria esperi* Milne Edwards & Haime, 1849; *Caeloria daedalea* (Ellis & Scholander, 1786); *Coeloria astraeiformis* (Milne Edwards & Haime, 1849); *Coeloria esperi* (Milne Edwards & Haime, 1849); *Coeloria rustica* (Dana, 1846); *Maeandra astraeiformis* (Milne Edwards & Haime, 1849); *Maeandra daedalea* (Ellis & Solander, 1786); *Maeandrina daedalea* (Milne Edwards & Haime, 1849); *Maeandrina rustica* Dana, 1846; *Meandra esperi* (Milne Edwards & Haime, 1849); *Platygyra astraeiformis* (Milne Edwards & Haime, 1849); *Platygyra esperi* (Milne Edwards & Haime, 1849); *Platygyra rustica* (Dana, 1846).

Material examined: Abu-Musa Island (ZUTC 6606), Sirri Island (ZUTC 6607).

Other Material: Kish island (ZUTC 6608), Nay-Band Bay (ZUTC 6609).

Description: Colony is encrusting and massive to sub massive. Corallites arrangement is meandroid. Septa are in two orders (mostly distinguishable). Septa slightly exert above the wall. Septal margins ornamented with teeth. Septal side frequently connected by a thin vertical ridge running parallel to the valley axis above the wall. Exertness of septa above the theca (ES) 1-2 mm, valley width (VW) 4-5 mm, valley depth (VD) 4.5-6 mm (vertically from the columella to the top of the septa). Paliform lobes absent. Columella present. Wall is thin and not perforated.

Remarks: The genus *Platygyra* is a common throughout the Indo-Pacific and its species displays wide genotypic and phenotypic variation (Veron et al. 1977). The specimens showed different colony forms and colors in the field (Fig. 16a-b), but skeletal examination indicated their corallites traits (VW, VD, ES, etc.) are stable, so that collected

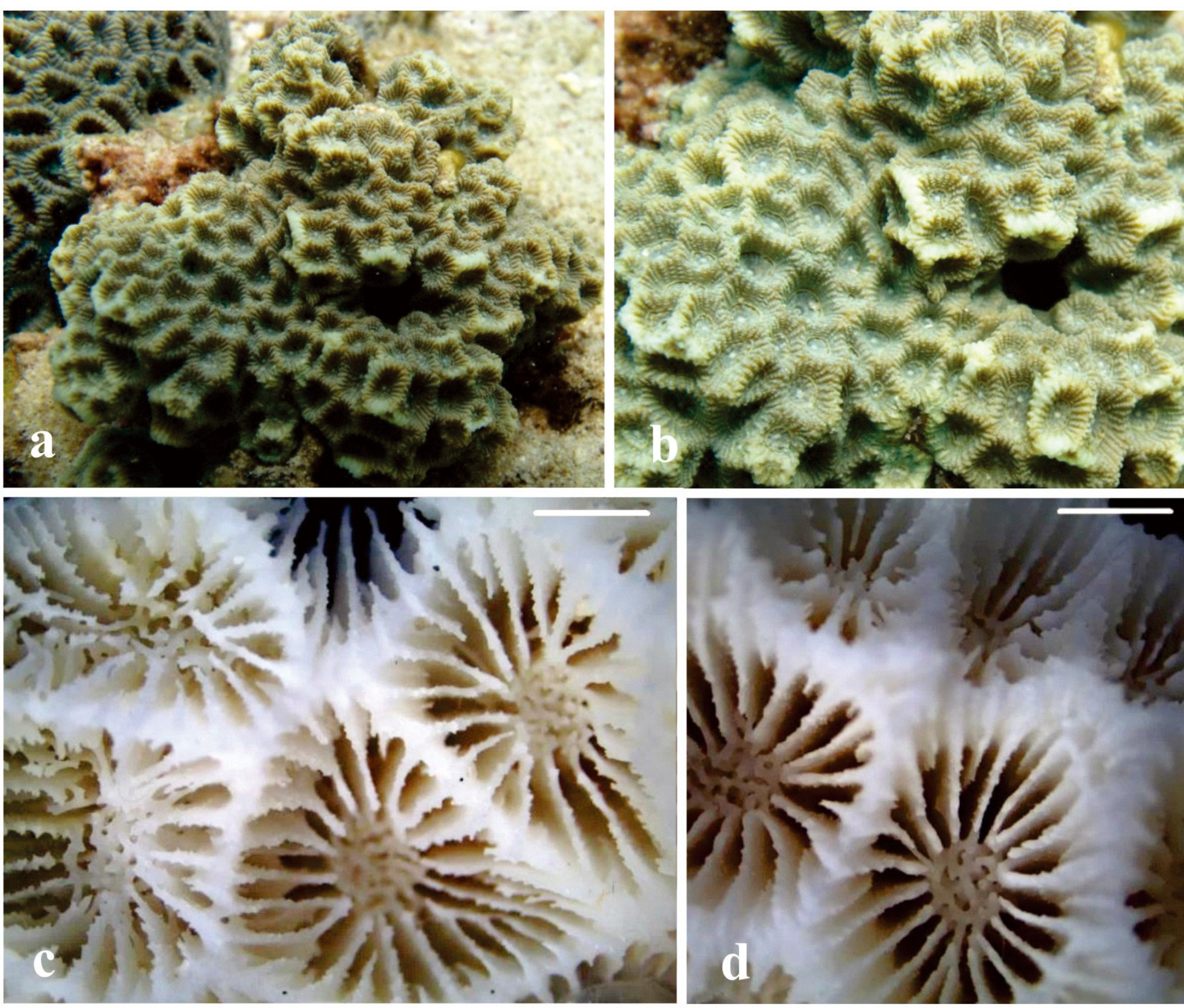

Fig. 15. (a-b) *Favites chinensis* from Abu-Musa Island; (c-d) close-up of corallites. Scale bar = 1 mm.

specimens belonged to a single species.

Distribution: Widespread in the Persian Gulf, Red Sea and Indo-Pacific.

Genus *Dipsastraea* de Blainville, 1830

***Dipsastraea pallida* (Dana, 1846)**
(Fig. 17)

Synonym: *Astraea* (*Fissicella*) *denticulata* Dana, 1846; *Astraea cellulosa* Verrill, 1872; *Astraea denticulata* Dana, 1846; *Astraea doreyensis* (Milne Edwards & Haime, 1857); *Astraea ordinata* Verrill, 1866; *Favia amplior* (Milne Edwards & Haime, 1849); *Favia denticulata* (Gardiner, 1904); *Favia doreyensis* Milne Edwards & Haime, 1850; *Favia laccadivica* Gardiner, 1904; *Favia okeni* Milne Edwards & Haime, 1857; *Favia pallida* (Dana, 1846); *Favia tubulifera* Klunzinger, 1879; *Goniastraea serrata* Ortmann, 1889; *Heliastrea borradailei* Gardiner, 1904; *Parastrea amplior* Milne Edwards & Haime, 1850; *Parastrea verrilleana* Milne Edwards & Haime, 1850.

Material examined: Abu-Musa Island (ZUTC 6610), Sirri Island (ZUTC 6611).

Other Material: Nay-Band Bay (ZUTC 6612), Kish Island (ZUTC 6613).

Description: Colony is massive and hemispherical. Corallites arrangement is plocoid to subplocoid, even sub ceroid in parts of the colony. Corallites formation by intratentacular budding. Corallite and calice diameter are 8-10 mm and 8-9 mm, respectively. 22-28 septa in two orders (sometimes indistinguishable). Septa are well separated and exert above the wall margin. Most septa descend abruptly down the endotheca and then reach the columella. Septal margins always ornamented with very short and irregular

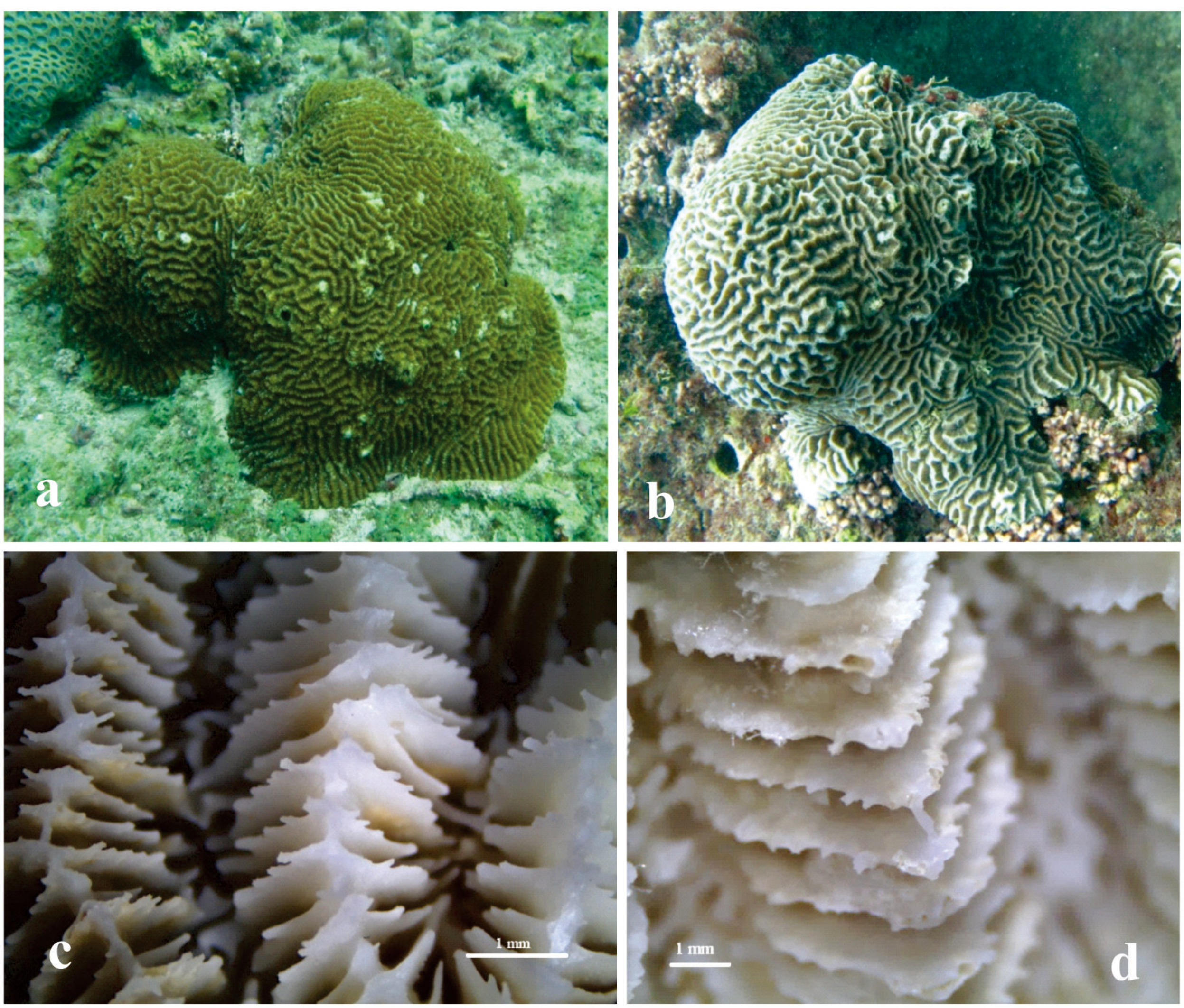

Fig. 16. (a-b) Different colonies of *Platygyra daedalea* from Abu-Musa (rather flat) and Sirri Islands (spherical); (c-d) close-up of corallites. Scale bar = 1 mm.

dentations. These dentations are themselves finely serrated, especially at their tips which frequently form minute horizontal fans. Palar structures absent (occasionally may be weakly present). Columella is spongy. Costae equal and sometimes adjacent costae join together.

Remarks: The specimens showed different colony forms and colors in the field; however, their

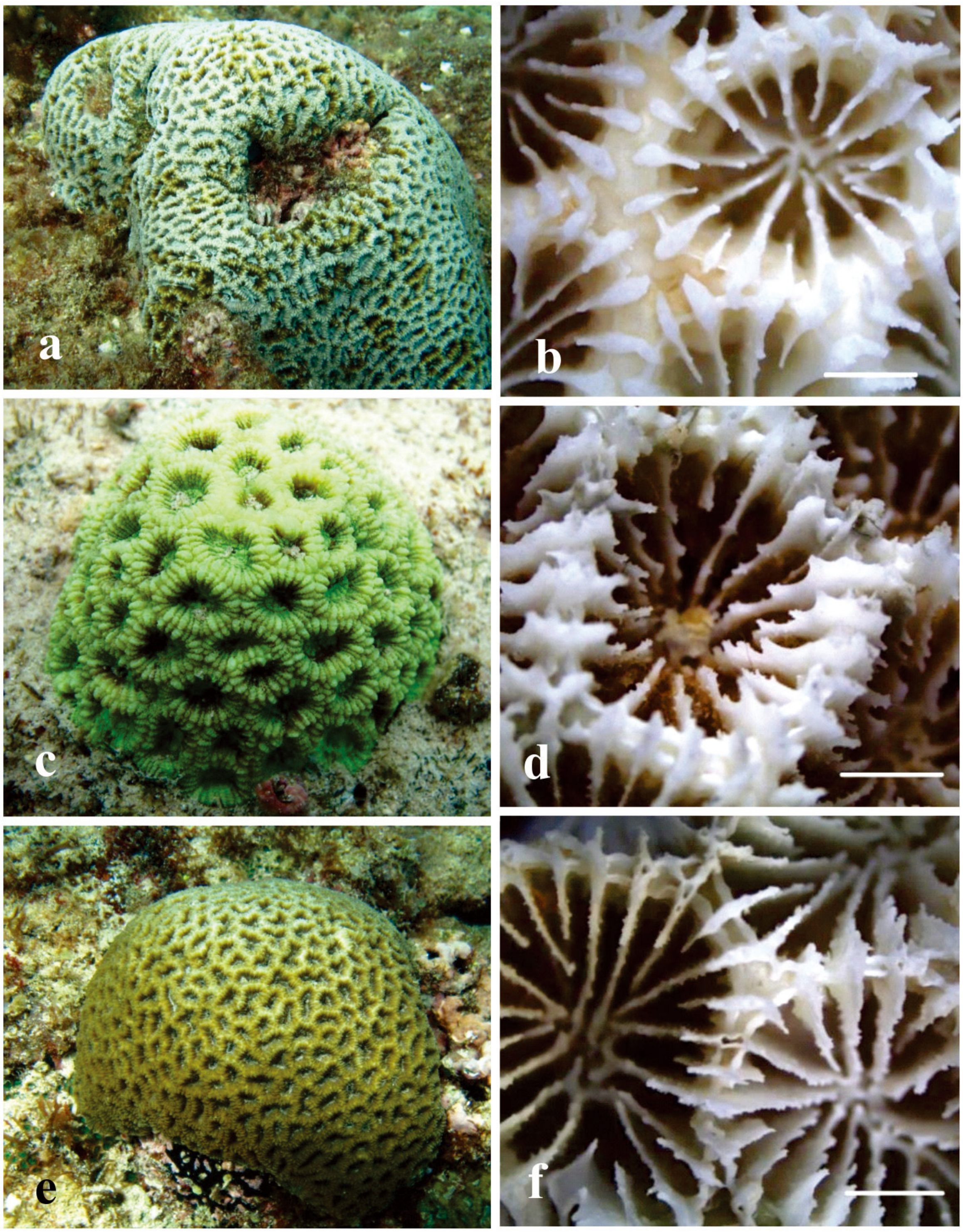

Fig. 17. (a-c-e) Different colonies of *Dipsastraea pallida* from Abu-Musa and Sirri Islands; (b-d-f) close-up of their corallites. Scale bar = 1 mm.

skeletal features were similar (Fig. 17a, c-d). *D. pallida* had a smaller corallite size than the other species and a slightly lower calic (Kongjandtre et al. 2012). Pale discoloration is because of presence mucus sheathing (Fig. 17a-c) (Alidoost Salimi et al. 2017).

Distribution: Widespread in the Persian Gulf, Red Sea and Indo-Pacific.

Dipsastraea favus **(Forskål, 1775)**
(Fig. 18)

Synonym: *Madrepora favus* (*pars*) Forskål, 1775; *Madrepora cavernosa* Forsskål, 1775; *Madrepora denticulata* Ellis & Solander, 1786; *Parastrea denticulata* Milne Edwards & Haime, 1849; *Favia jacquinoti* Milne Edwards & Haime, 1857; *Favia geoffroyi* Milne Edwards & Haime, 1857; *Favia deformata* Milne Edwards & Haime, 1857; *Favia aspera* Milne Edwards & Haime, 1857; *Favia ehrenbergi* Klunzinger, 1879; *Orbicella borradailei* Gardiner, 1904.

Material examined: Sirri Island (ZUTC 6614).

Description: Colony is massive and hemispherical. Corallites are circular and arrangement is plocoid. Corallites formation by extratentacular budding. Corallite and calice diameter 9-12 mm and 7-11 mm, respectively. Septa are well separated and exert above the wall margin. 24-40 septa in 2 or 3 orders. Primary order septa reach columella, third order reduced or abortive (orders sometimes indistinctive). Septa descend steeply into the calyx immediately from the wall towards the center. Palar structures absent or weakly developed. Columella is compact. Costae equal, dentate and adjacent costae sometimes joined together. Coenosteum smooth

Remarks: The skeleton did not clearly show the more common shape of the corallites, and it should be noted that there is considerable intraspecific variability in this particular species.

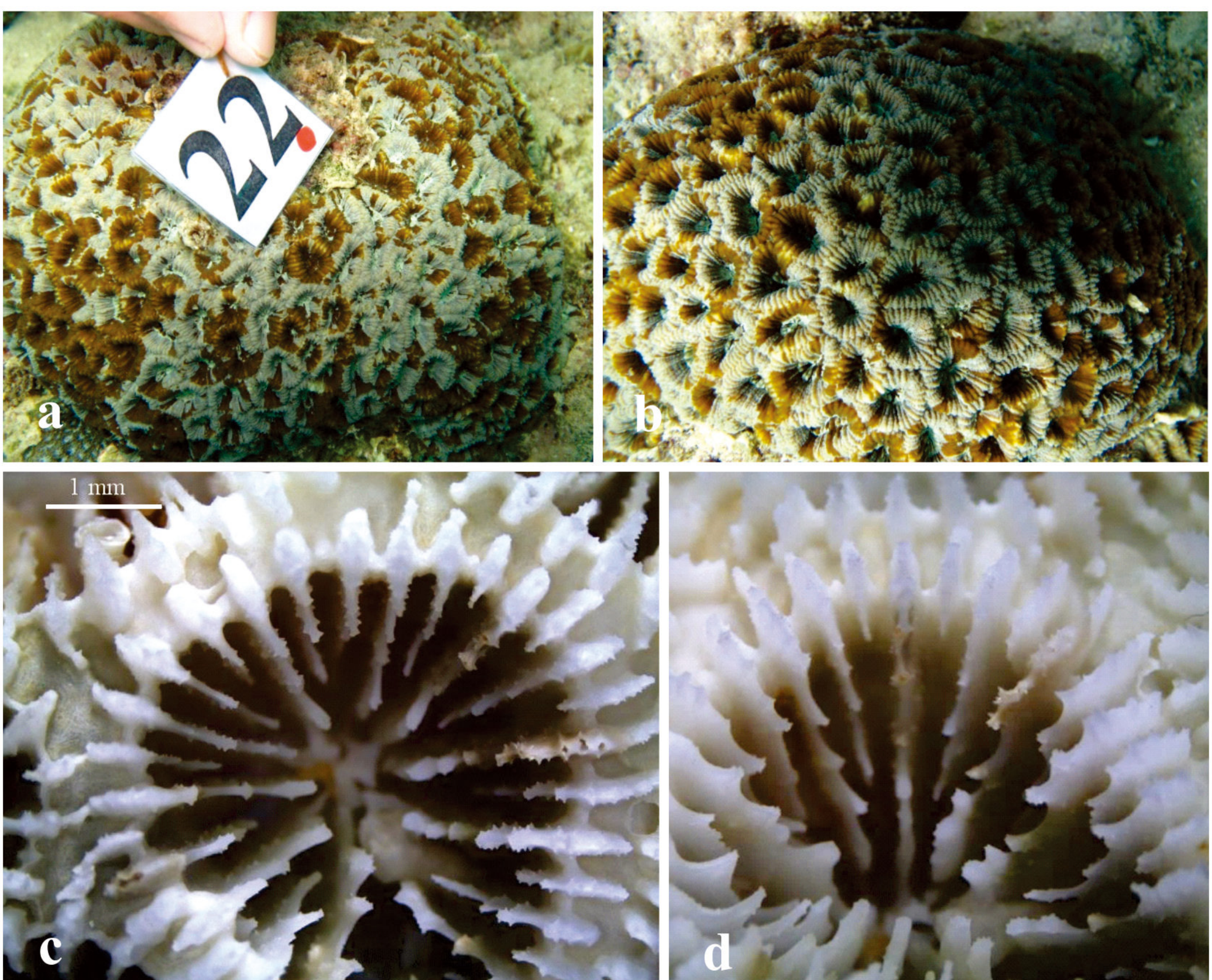

Fig. 18. (a-b) *Dipsastraea favus* from Sirri Island; (c-d) close-up of corallites. Scale bar = 1 mm.

Dipsastraea favus displays a larger corallite size and higher calice compared to *D. pallida* (Kongjandtre et al. 2012), and this feature has been considered as a main criterion for identification. The pale mucus sheaths were peeling off, revealing the normal coloration underneath (Alidoost Salimi et al. 2017) (Fig. 18a-b).

Distribution: Uncommon in the Persian Gulf.

Dipsastraea rotumana **(Gardiner, 1899)**
(Fig. 19)

Synonym: *Astraea rotumana* Gardiner, 1899; *Favia rotumana* (Gardiner, 1899)

Material examined: Sirri Island (ZUTC 6615).

Description: Colony is massive and hemispherical. Corallites outline are circular and irregular. Corallite arrangement is plocoid but occasionally tending to cerioid. Corallites formation by intratencular budding. Corallites and calice diameter are 9-13 mm and 7-11 mm, respectively. Septa are well separated and markedly exert above the wall margin. 24-38 septa in two or three orders. Primary septa are distinctively taller and thicker than the others, and steep descending. Secondary septa are shorter and descend abruptly down the calice without reaching the columella; third order septa abortive. Septal margins with conspicuous irregular dentations at times flattened transversally. All septa descend abruptly down the calice. Palar structures absent. Columella is small, trabecular. Costae equal and ornamented. Coenosteum smooth.

Remarks: Pale discoloration is because of

Fig. 19. (a) *Dipsastraea rotumana* from Sirri Island; (b) corallite/primary septa taller and thicker than other; (c-d) close-up of septa. Scale bar = 1 mm.

presence mucus sheathing (Fig. 19a) (Alidoost Salimi et al. 2017). The specimen seems relatively close to *D. favus* but the primary septa are distinctively taller and thicker than the other septa, which is characteristic of *D. rotumana* (Sheppard and Sheppard 1991; Veron et al. 1977).

Distribution: Rare in the Persian Gulf, common in the Red Sea and Indo-Pacific.

Family Lobophylliidae Dai and Horng, 2009
Genus *Acanthastrea* Milne Edwards and Haime, 1848

***Acanthastrea echinata* (Dana, 1846)**
(Fig. 20)

Synonym: *Astrea echinata* Dana, 1846; *Astrea patula* Dana, 1846; *Acanthastrea spinosa* Milne Edwards & Haime, 1848; *Acanthastrea hirsuta* Milne Edwards & Haime, 1857; *Acanthastrea brevis* Milne Edwards & Haime, 1849; *Acanthastrea grandis* Milne Edwards & Haime, 1849; *Favia hirsuta* (Milne Edwards & Haime, 1857); *Favites hirsuta* (Milne Edwards & Haime, 1857).

Material examined: Abu-Musa Island (ZUTC 6616).

Description: Colony is encrusting to massive with fleshy polyps. Corallites arrangement is cerioid and formation by intratentacular (sometimes marginal) budding. Outline circular to subcircular. Corallites diameter variable (average 10-15 mm). 24-31 septa in one order and reaching the columella. They are continuous over the wall extending from one corallite to the adjacent ones. Upper septal margin with 3-5 conspicuous,

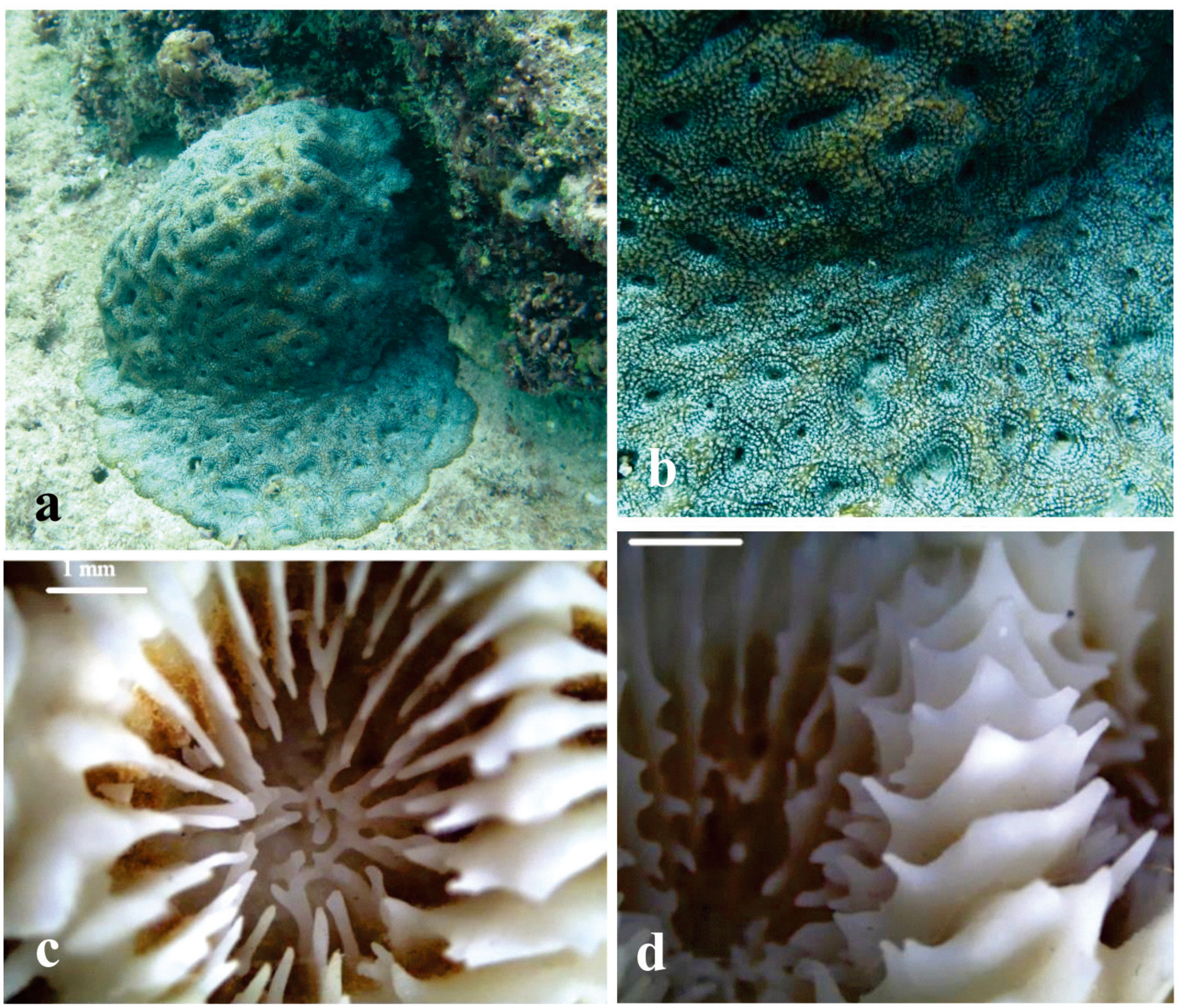

Fig. 20. (a-b) *Acanthastrea echinata* from Abu-Musa Island; (c) close-up of corallites; (d) septal margin with 3-5 conspicuous. Scale bar = 1 mm.

large dentations with acute tips. Septal sides smooth. Columella is compact, a tangle of twisted trabecular.

Distribution: Common in the Persian Gulf, Red Sea and Indo-Pacific.

Family Poritidae Gray, 1842
Genus *Porites* Link, 1807

***Porites harrisoni* Veron, 2000**
(Fig. 21)

Synonym: *Porites harrisoni* Veron, 2000.

Material examined: Abu-Musa Island (ZUTC 6617), Sirri Island (ZUTC 6618).

Other Material: Nay-Band Bay (ZUTC 6619), Kish Island (ZUTC 6620).

Description: Colony basically columnar, but may tend towards nodular or even branching. An encrusting base may be visible. Color is mostly shades of dark brown. Corallites round to polygonal. Calice diameter 0.8 to 1 mm. Septa well developed with complete lateral pairs. Dorsal directive is relatively smaller than lateral pairs. Ventral triplet is generally free. Uncommonly a fusion (trident) may be observed. A synapticular ring may be present, deeper in the calice. Eight well developed pali, those of the dorsal directive septum and triplet being usually smaller than those of the lateral pairs. Generally one granule present on the septa, between the pali and the wall.

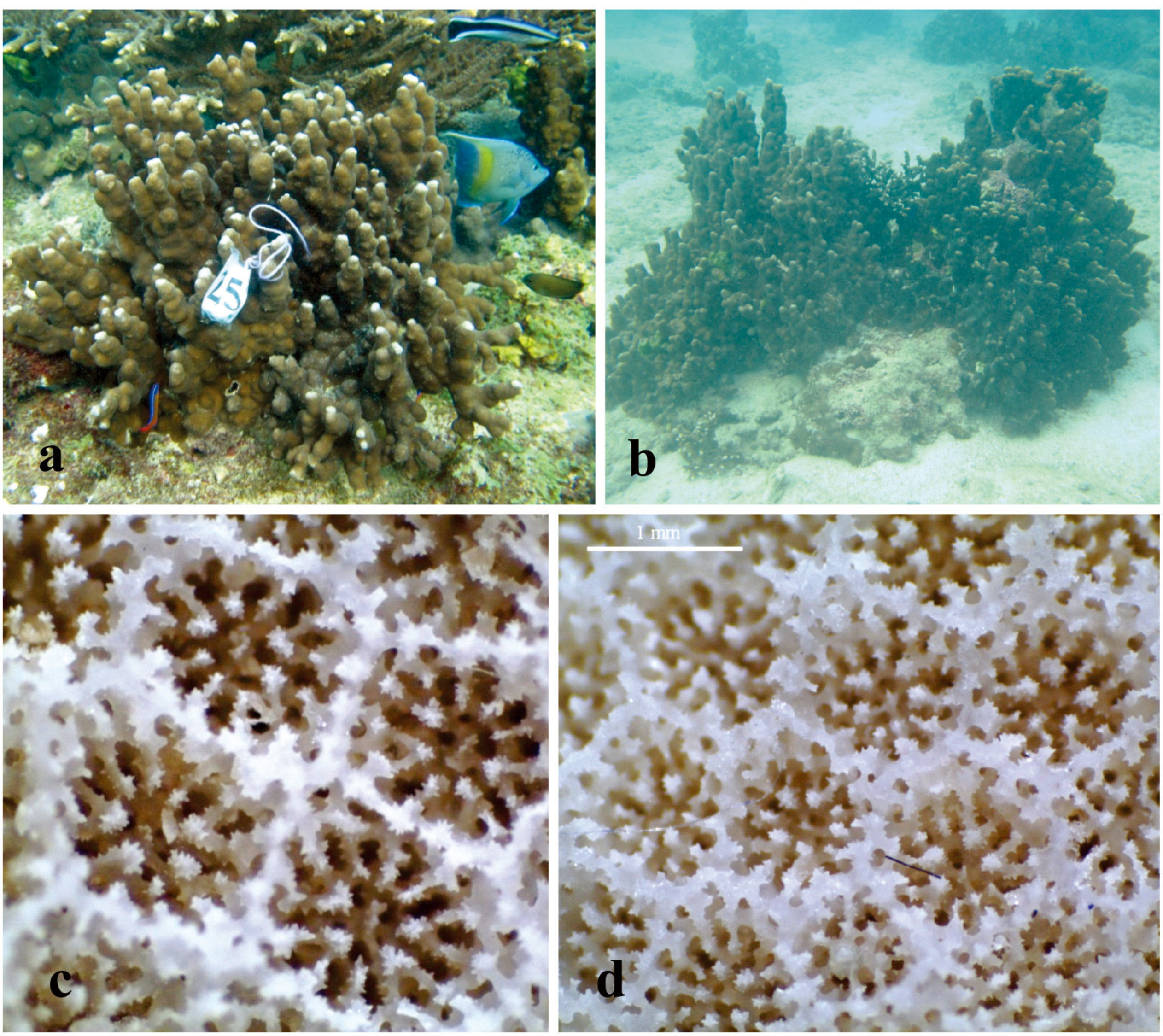

Fig. 21. (a-b) *Porites harrisoni* from Abu-Musa and Sirri Islands; (c-d) close-up of corallites. Scale bar = 1 mm.

Columella is small and styliform. Wall mostly thin with a row of granules on the upper edge.

Remarks: The growth forms are nodular, columnar to branching, hence very different in comparison to *P. lobata* and *P. lutea*; the only similar species is *P. nodifera*, which makes much thicker columns and is rare in the Persian Gulf (Riegl and Purkis 2012). Some of the specimens from the Persian Gulf referred in the literature as *P. compressa* may actually belong to the present species.

Distribution: The species is very common inside the Persian Gulf and is also present in the North West Arabian Sea (Gulf of Oman, Gulf of Aden) and the Red Sea.

***Porites lobata* Dana, 1846**
(Fig. 22)

Synonym: *Porites* (*Porites*) *lobata* Dana, 1846; *Porites lobata* cf. *nodulosa* Hoffmeister, 1925; *Porites globosa* Nemenzo, 1976; *Porites excavata* Verrill, 1869.

Material examined: Abu-Musa Island (ZUTC 6621), Sirri Island (ZUTC 6622).

Other Material: Kish Island (ZUTC 6623).

Description: Colony thick encrusting to small massive. Surface may near some humps. Corallites round to polygonal. Calice diameter 1.0-1.5 mm. Septa well developed with complete lateral pairs; dorsal and ventral directives smaller than other septa. Ventral triplet is free (no fusion). Eight weakly developed pali, those of the dorsal directive septum and triplet usually being smaller than those of the lateral pairs. One granule present on the septa between the pali and the wall. Inner synapticular ring present. Columella present well-developed and styliform. Wall mostly thin, ornamented with a row of spicule-like granules on the upper edge.

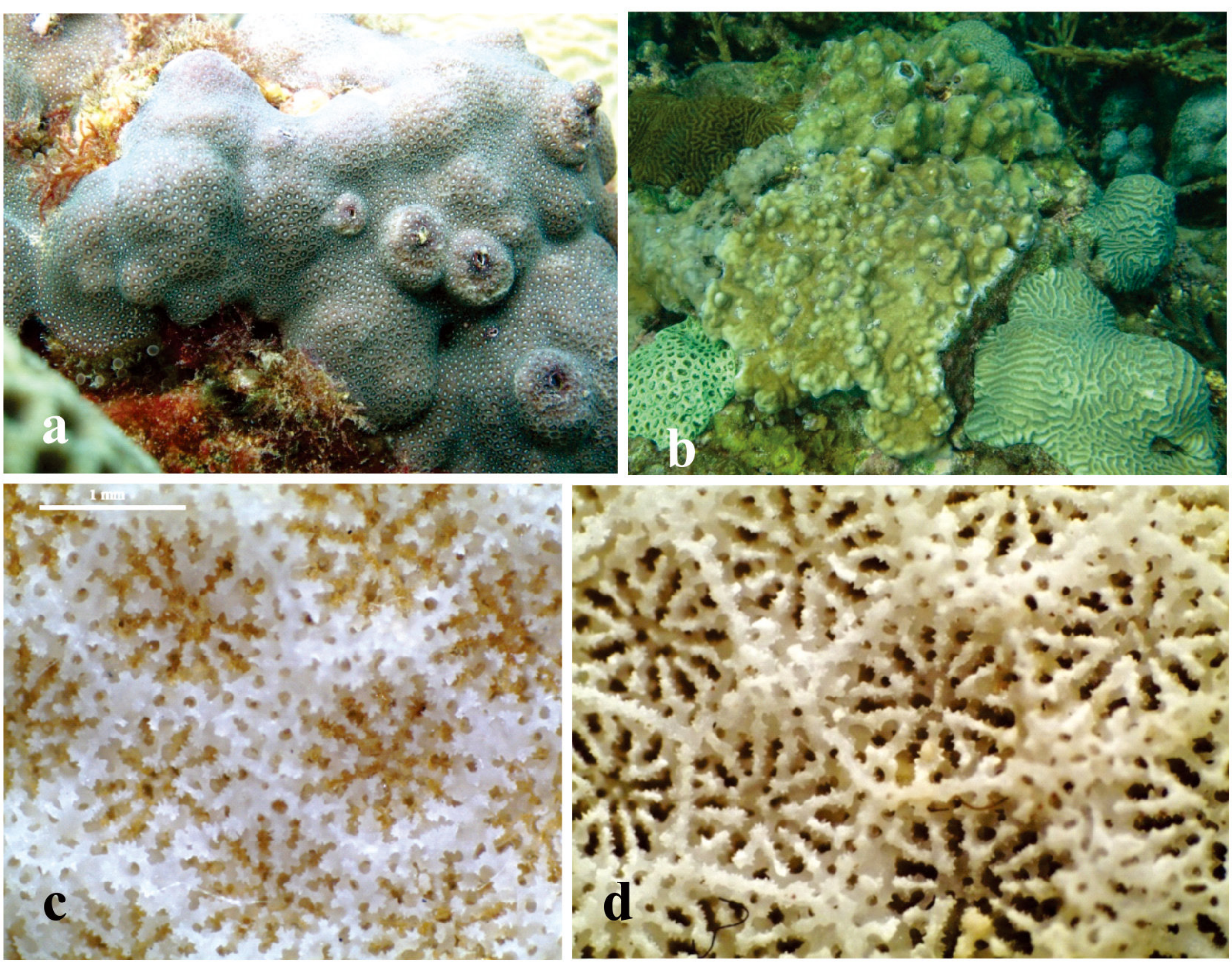

Fig. 22. (a-b) Different colonies of *Porites lobata* from Sirri and Abu-Musa Islands; (c) close-up of corallites and septal arrangements; (d) ventral triplet free. Scale bar = 1 mm.

Remarks: The species differs from *P. harrisoni* in having encrusting or massive colony forms and eight weakly developed pali. Specimens display different morphotypes, while skeletal examination indicated septal pattern (as main criterion) is remarkably stable (Fig. 22c-d). It seems that *P. lobata* specimens are able to reform their growth strategy in order to persist over the reef framework (Tortolero-Langarica et al. 2016).

Distribution: Widely distributed throughout the Persian Gulf. Very common in the Indo-Pacific and Pacific Ocean.

Porites lutea **Milne Edwards and Haime, 1851**
(Fig. 23)

Synonym: *Porites conglomerata* var. *lutea* Quoy & Gaimard, 1833; *Porites lutea* Milne Edwards & Haime, 1851; *Porites arenosa* var. *lutea* Gardiner 1898; *Madrepora arenosa* Esper, 1797; *Porites tenuis* Verrill, 1866; *Porites haddoni* Vaughan, 1918.

Material examined: Abu-Musa Island (ZUTC 6624), Sirri Island (ZUTC 6625).

Other Material: Nay-Band Bay (ZUTC 6626).

Description: Color is light yellow to brown. Colony is submassive to massive. Corallite outline round to polygonal. Calice diameter 1.0-1.3 mm. Septa well developed and lateral pairs are complete and fusing at the end. Dorsal directive is much smaller than other septa, ventral triplet with characteristic trident formation. One inner synapticular ring present, five pali developed, one at the end of each lateral pair and one on

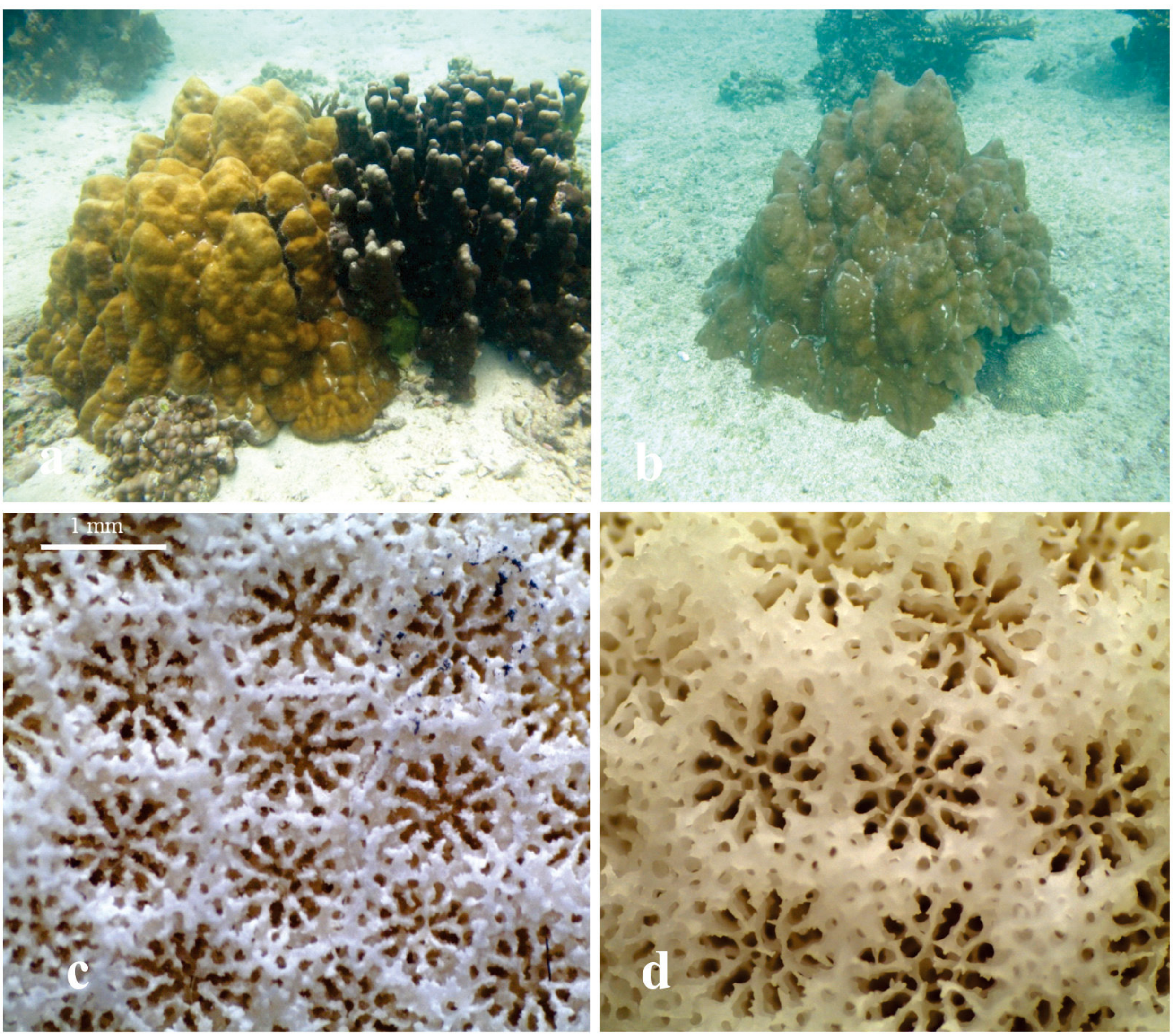

Fig. 23. (a-b) Different colonies of *Porites lutea* from Abu-Musa and Sirri Islands; (c) close-up of corallites and septa arrangements; (d) ventral triplet with trident fusion. Scale bar = 1 mm.

the ventral directive. Radii joining the pali to the columella may be present particularly between the ventral directive and the columella. Generally one granule present between the pali and the wall. Columella present but often small styliform. Wall mostly thin with a row of spicules on the upper edge.

Remarks: This species differs from *P. harrisoni* and *P. lobata* in having a ventral triplet with a conspicuous trident formation. The collected specimens have different morphotypes (Fig. 23a-b); but septal pattern (as main trait) was constant in collected specimens (Fig. 23c-d).

Distribution: Common in the Persian Gulf and widely distributed in the Indo-Pacific.

Genus *Goniopora* de Blainville, 1830

Goniopora columna Dana, 1846
(Fig. 24)

Synonym: *Goniopora columna* Dana, 1846.

Material examined: Abu-Musa Island (ZUTC 6627).

Description: Colony is columnar. Corallites are subcircular to polygonal and formation by extratentacular budding, diameter 2.5 to 3 mm. Calice shallow, less than 1 mm deep. Irregular septa, arrangement is gonioporoid and sometimes indistinct. Septa consist of perforated vertical plates and occasionally continuous over the wall of adjacent corallites. Columella is broad, spongy, filling up to 1/2 calice diameter. Wall comparatively thin, porous, but not heavily perforated. Polyps like for many other species of *Goniopora*, polyps are fully extended during daytime. A whitish oral cone is conspicuous.

Distribution: Rare in the Persian Gulf. Relatively common in the Indo-Pacific.

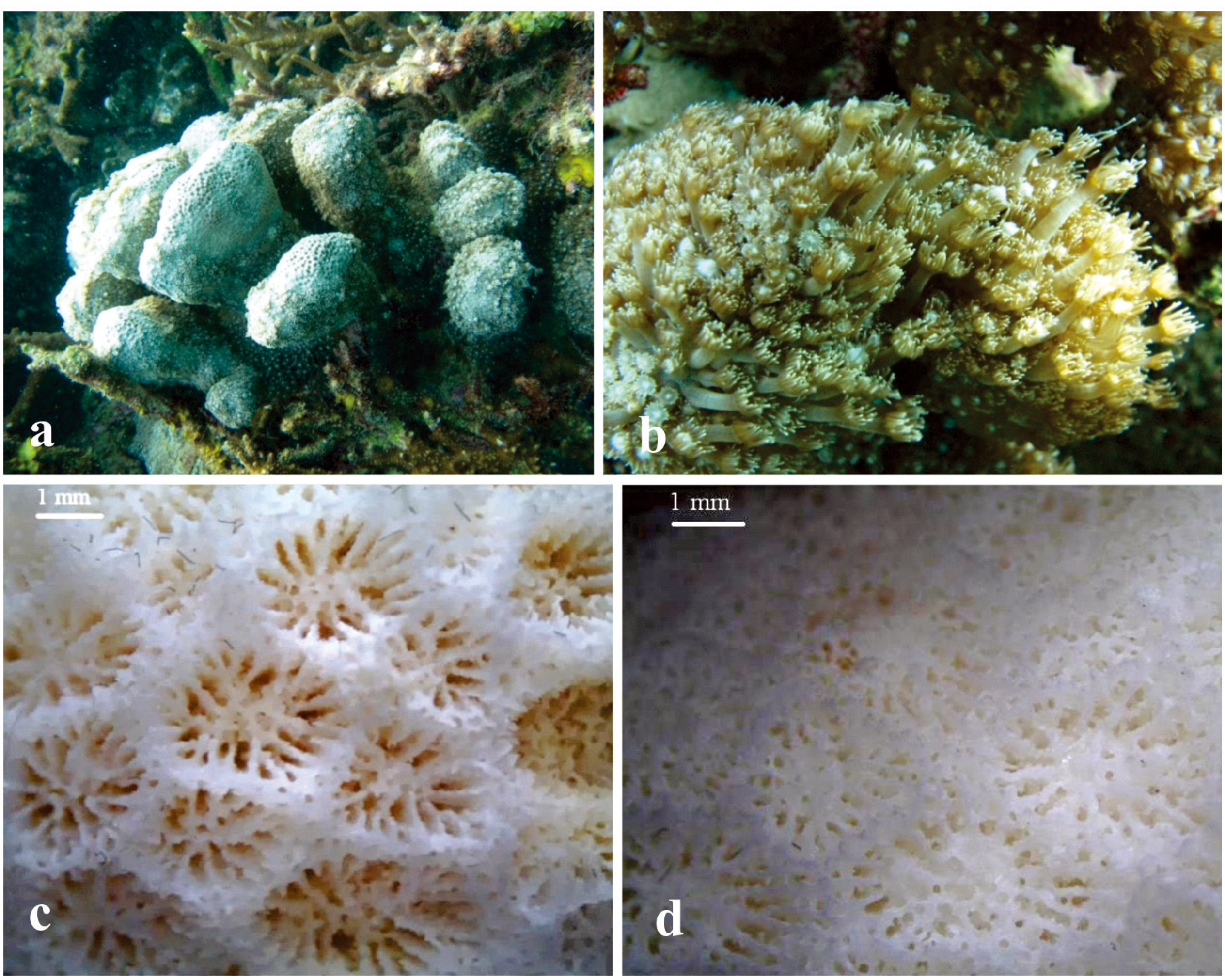

Fig. 24. (a-b) *Goniopora columna* from Abu-Musa Island; (c-d) close-up of corallites. Scale bar = 1 mm.

Goniopora djiboutiensis Vaughan, 1907
(Fig. 25)

Synonym: *Goniopora djiboutiensis* Vaghan 1907; *Goniopora pulvinella* Wells, 1954.

Material examined: Sirri Island (ZUTC 6628).

Description: Colony is thick encrusting to submassive. Corallites are circular to polygonal and formation extratentacular budding. Corallite diameter is 5 mm. Corallites depth 2-3 mm. Septa regularly arranged in 24 septa (up to 36 in larger corallites). Gonioporoid arrangement pattern in most of septa equal and short, only projecting inwards into the calice to a limited extent, but 6-8 of them reach the columella. Free margins serrated and sides highly perforated at times ornamented with clearly visible short protuberances. Columella is well developed, spongy and dome-shaped. Wall is synapticular, a porous fenestrate meshwork of ragged appearance and thickness variable.

Remarks: The specimen displays some affinities with *G. stokesi*, Milne Edwards and Haime, 1851, in particular with respect to the depth of the calices and very fenestrate wall. It is ascribed here to *G. djiboutiensis* on the basis of the regularly arranged short septa, while the 6 primaries are conspicuous in reaching the columella, and of a dome-shaped columella.

Distribution: Rare in the Persian Gulf.

Family Psammocoridae Chevalier and Beauvais, 1987
Genus _Psammocora_ Dana, 1846

Psammocora stellata Verrill, 1866
(Fig. 26)

Synonym: *Psammocora* (*Stephanaria*) *stellata* Verrill, 1866; *Psammocora* (*Stephanaria*) *brighami* (Vaughan, 1907); *Psammocora planipora* Milne Edwards & Haime, 1851 (possible hybrid); *Stephanacora stellata* Verrill, 1866; *Stephanaria brighami* Vaughan, 1907.

Material examined: Abu-Musa Island (ZUTC 6629), Sirri Island (ZUTC 6630).

Other Material: Nay-Band Bay (6631), Kish island (ZUTC 6632).

Description: Colony with an encrusting base, from which stem numerous short and knobby branches. Corallite are polygonal and shallow. Calice diameter is 1-1.5 mm. Septa are thin. Septal margins and septocostae carry granulated dentations. Columella short, trabecular and composed of a few trabecular processes.

Distribution: Common in the Persian Gulf.

Family Siderastreidae Vaughan and Wells, 1943
Genus _Siderastrea_ de Blainville, 1830

Siderastrea savignyana Milne Edwards and Haime, 1850
(Fig. 27)

Synonym: *Siderastrea savignyana* Milne Edwards & Haime, 1850.

Material examined: Abu-Musa Island (ZUTC 6633).

Other Material: Nay-Band Bay (ZUTC 6634).

Description: The living colony has light blue

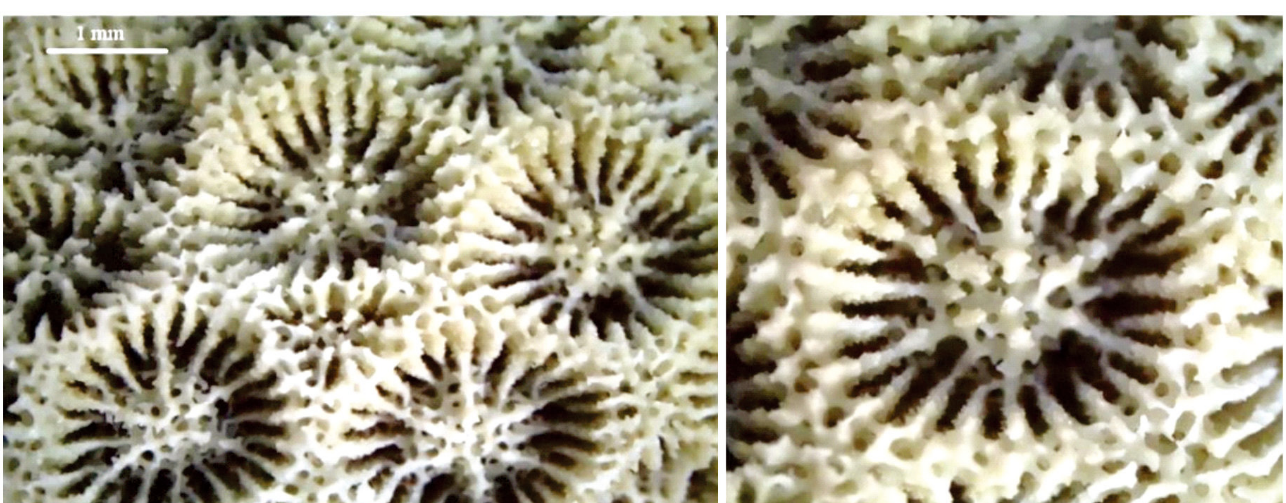

Fig. 25. *Goniopora djiboutiensis* from Sirri Island; (a) extratentacular budding; (b) close-up of corallites. Scale bar = 1 mm.

color. Colony is thick encrusting to submassive. Corallum surface with irregular humps. Corallites arrangement is cerioid and formation by extratentacular budding. Corallites are polygonal to subcircular in outline and small-sized (maximum diameter 3 mm). 24-30 septa are in 2 orders. The inner free margin of the second order septa curve and fuse with first order septa, forming the characteristic triangular group or wedge commonly found in the families Siderastreidae and Coscinaraeidae. Septal free upper margin gently and regularly sloping towards the center of the calice. Wall is synapticulothecal with 2 clearly visible rings and the inner one often incomplete. Columella well developed, a solid mass and slightly elongated or oval in outline.

Remarks: This species mostly founds in the sedimentary substrate, and sometimes have to take the sediments off to find it. This species is considered to be the mono-species of *Siderastrea* in the Persian Gulf and is restricted to west of Indo-Pacific.

Distribution: Relatively common in the Iranian waters.

DISCUSSION

The coral fauna of the Persian Gulf is a subset of the general Indo-Pacific fauna, with

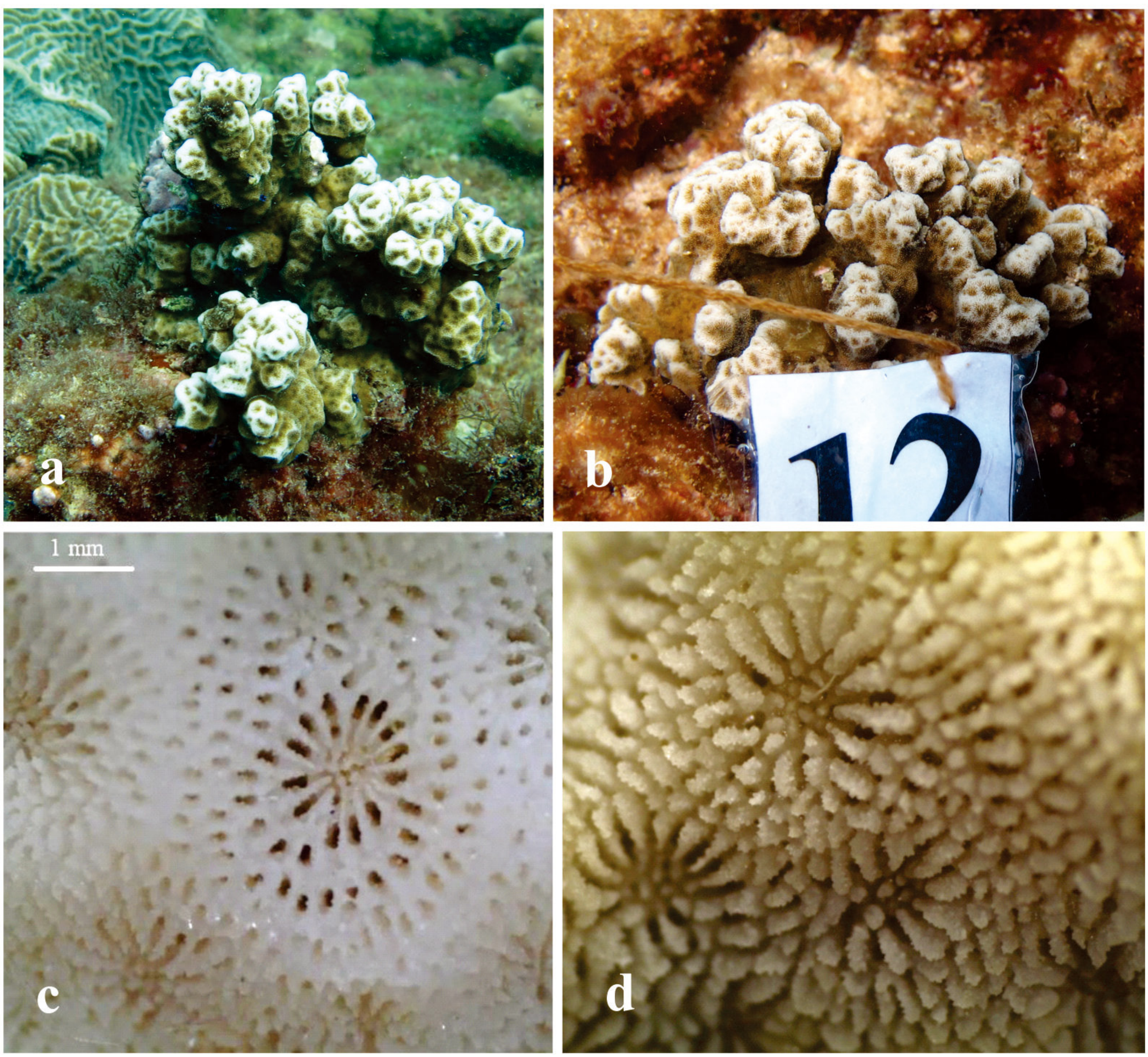

Fig. 26. (a-b) *Psammocora stellata* from Abu-Musa Island and Sirri Island; (c-d) close-up of corallites. Scale bar = 1 mm.

about 10% of the total Indo-Pacific species are also found in the Persian Gulf (Coles 2003). The presence of two species *Acropora downingi* and *Porites harrisoni* with a restricted regional distribution in the Persian Gulf, Gulf of Aden and the Red Sea is to be noted, although their origins remain questionable. The Abu-Musa and Sirri Islands have coral carpets with mono-specific stands dominated mainly by *A. downingi* and *Porites* species. These species have an important role in building the coral carpets of the Persian Gulf (Sheppard and Sheppard 1991; Benzoni et al. 2006; Alidoost Salimi et al. 2017).

Most, but not all, of the coral species in Abu-Musa and Sirri Islands are similar to those that occur in other parts of the Persian Gulf. Corals *P. decussata*, *P. daedalea*, *C. microphthalma*, *D. pallida*, *A. downingi*, *P. harrisoni*, *P. lutea*, *P. lobata*, *P. stellata*, *S. savignyana* and *F. pentagona* have a wide distributions and are among the common species in this region (Carpenter et al. 1997; Fatemi and Shokri 2001; Riegl and Purkis 2012; Vajed Samiei et al. 2013; Moradi et al. 2014; pers obs). It seems that these species are able to withstand the salinity, sedimentation and temperature fluctuations of the Persian Gulf (Riegl and Purkis 2012; Burt et al. 2014; Alidoost Salimi et al. 2017).

This study illustrates different morphotypes of some widespread species, including *P. daedalea*, *P. decussata*, *F. pentagona*, *D. pallida*, *P. lutea* and *P. lobata*. In addition, we documented two morphotypes for *F. pentagona* that had never been considered previously. It is understandable that coral species can display morphological variations in response to environmental conditions and substrates. Even though this morphological variability creates a problem for identifying species,

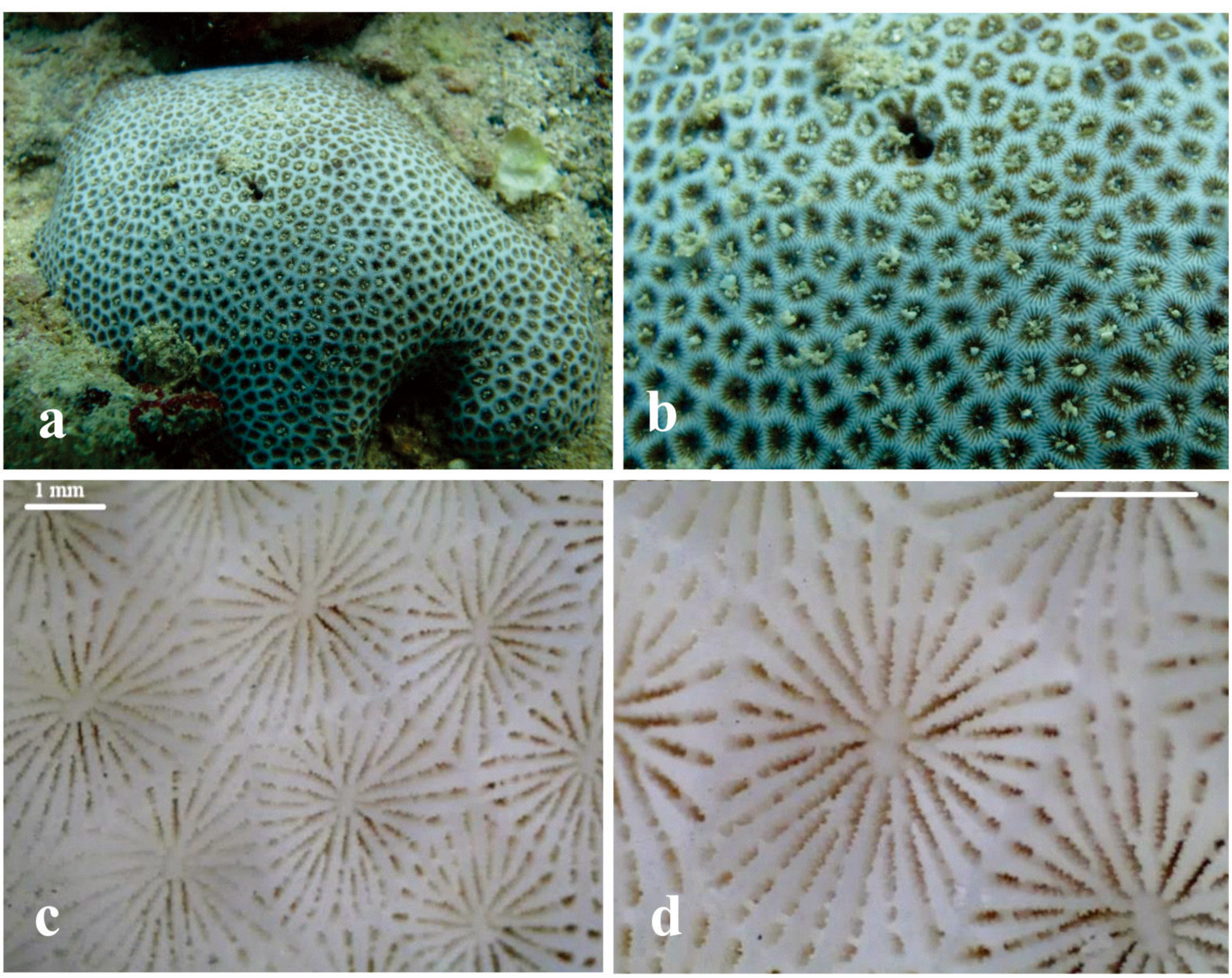

Fig. 27. (a-b) *Siderastrea savignyana* from Abu-Musa Island; (c) corallites; (d) synapticulothecal theca with two rings. Scale bar = 1 mm.

it is a valuable strategy to survive and tolerate the environmental variability (Mangubhai et al. 2007; Todd 2008). Different morphotypes for some of the above-mentioned species have already been reported in the Indo-Pacific and Pacific Oceans. In particular, the multiple-morphology seems to be a common occurrence for *Platygyra* (Miller 1994). It is likely that such variations play a key role in explaining the widespread distribution of mentioned species in a variety of environments throughout the Indo-Pacific, including the Persian Gulf (Miller 1994; Mangubhai et al. 2007; Tortolero-Langarica et al. 2016). The coral morphotypes have never been considered in the Persian Gulf, so molecular studies are needed to clarify the right situation of mentioned species.

Conversely, some species recorded in this study are restricted to Iranian waters or have not been recorded in the southern regions. *Leptastrea pruinosa*, for instance, is only reported in Iranian waters. This species occurs in most coral carpets of Iranian islands (Vajed Samiei et al. 2013; Fatemi and Shokri 2001; pers obs). The poritid genus *Goniopora* is generally restricted to Iranian waters, and only one species, *G. lobata*, has been recorded in Kuwait (Carpenter et al. 1997; Coles 2003; Riegl and Purkis 2012). In this study, *G. columna* and *G. djiboutiensis* were found in Abu-Musa and Sirri Islands, respectively, but were not reported in southern coral communities. Both species are widely distributed throughout the Indo-Pacific (Veron and Pichon 1982; Sheppard and Sheppard 1991).

This study reported two species *P. cactus* and *D. rotumana* in Sirri Island. *Pavona cactus* is a rare species that had previously been reported only once in Kuwait (Sheppard and Shappard 1991). It occurs mostly in turbid and sheltered conditions and has a wide distribution throughout the Indo-Pacific. This species commonly occurs in the Red Sea (Veron and Pichon 1979; Pichon et al. 2010; Riegl and Purkis 2012; Rasul and Stewart 2015). *Dipsastraea rotumana* was commonly presumed to be present in the Persian Gulf without any evidence of its record (Riegl and Purkis 2012), and the current report confirms that it is indeed present in the Gulf. This species is restricted to the western Indo-Pacific and displays a wide variation in structure (Veron et al. 1977).

It should be noted that *Stylophora pistillata*, *Pocillopora damicornis*, *Echinophyllia aspera*, *Cycloseris curvata*, and *Acropora pharaonis* have previously been reported from some part of the Persian Gulf (Riegl and Purkis 2012; Vajed Samiei et al. 2013; Moradi et al. 2014), but were not found during our survey. The reason for the presence or absence of some species in different parts of the Persian Gulf remains unclear. Coles (2003) believed that there are geographic discrepancies in the number and type of coral species in the Persian Gulf. In general, differences in the presence or absence of species in each area can be explained by the variable environmental factors that affect the corals, such as the different requirements of substratum necessary for larval settlement (Coles 2003). These differences may also be due to rarity, different sampling methods and presence in infrequent habitats (Benzoni et al. 2006; DeVantier and Turak 2017).

Psammocora has a wide geographic distribution in the Indo-Pacific. This genus comprises of six species in the Persian Gulf: *P. superficialis*, *P. stellata*, *P. contigua*, *P. haimeana*, *P. profundacella* and *P. albopicta* (Riegl and Purkis 2012; Vajed Samiei et al. 2013). Hybrids between *P. contigua* and *P. stellata* have been reported from Kuwait (Benzoni et al. 2007). Hence, in this study the authors refer only to *P. stellata*, with a note stating that in the reefs of Kuwait, at least, the populations are hybrids in nature between *P. contigua* and *P. stellata*. The possible existence of such hybrids on Sirri and Abu-Musa Islands has not been tested yet and the status of previous taxonomic records of *P. contigua* in the Persian Gulf needs to be reappraised.

Providing additional criteria for identification is practically impossible for certain genera with less distinctive skeletal features. Therefore, molecular analyses are often necessary to determine species boundaries. *Montipora* is one of the genera that is relatively restricted to the northern parts and, due to its morphological variations and skeletal features, needs to be studied further (Riegl and Purkis 2012). The presence of *Montipora* in the Persian Gulf has drastically decreased in the last two decades (Riegl and Purkis 2012). In contrast, this genus is one of the main genera in the Red Sea's coral community (Rasul and Stewart 2015). In this study, only one specimen belonging to *Montipora* was reported from Abu-Musa Island. However, species identification was not possible.

The Fungiidae are known as free-living corals that generally occur on soft bottoms, especially in the deep zone. The Fungiidae are not common in the Persian Gulf and only *Cycloseris curvata* was observed in the coral community of Abu-Musa and Farur Islands and Kuwait (Riegl and Purkis 2012). Interestingly, a large community of *C. fragilis*, *C. costulata* and *C. curvata* has been recently discovered in Qatar (Hoeksema et al. 2018). This phenomenon rarely occurs in the Persian Gulf and the reason for such a large coral aggregation in deep waters is not clear.

Finally, *Favites micropentagona* (ZUTC Cnid. 1021) and *Goniopora columna* (ZUTC Cnid. 1014), which were previously reported from Larak Island (Vajed Samiei et al. 2013), have been re-examined and were found to belong to *F. pentagona* and *G.* cf. *lobata*, respectively.

CONCLUSIONS

Our study provides insights into corals species in Abu-Musa and Sirri Islands. Overall, 26 species were found from Abu-Musa and Sirri Islands, and *P. cactus* and *D. rotumana* were added to the present list of coral species in Iranian waters. An aggregate of the current study and earlier reports from other islands showed that more than 50 species occur in the Iranian waters, with the highest number of species belonging to the Larak Island (40 species). Coral species in Iranian waters have mostly been reported in shallow waters (3-9 m). However, this study and previous studies show that coral species occur in deep waters as well (up to 22 m).

Although, coral fauna composition in the Persian Gulf are poor compared with that of the Indo-Pacific, further surveys may reveal the existence of more species from the Indo-Pacific in the Persian Gulf. Also, some species such as *F. chinensis*, *P. cactus*, *D. rotumana* and *G. columna*, which at this stage appear to be rare, may prove to be more common.

The current coral fauna of the Persian Gulf compared to that of the Indo-Pacific leads us to hypothesize that the fauna of Gulf is not only a subset of the Indo-Pacific fauna, but there is also an additional, albeit small, stock of species of unknown origin restricted to the Persian Gulf, Gulf of Aden and the Red Sea.

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